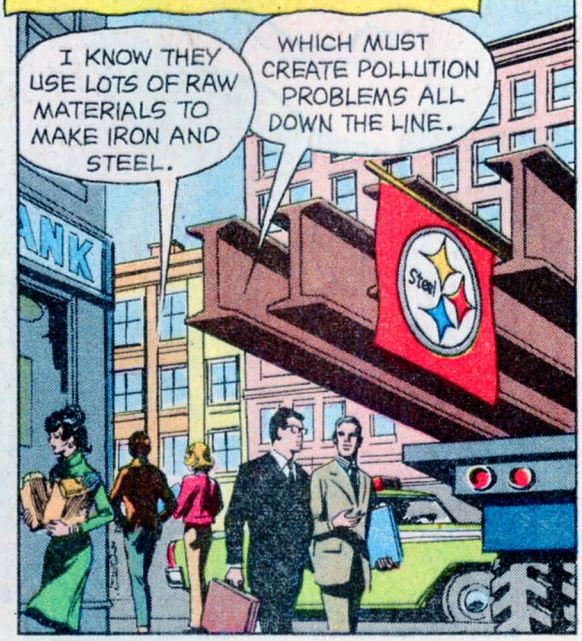
MARK STEEL
Fights Pollution!

MARK STEEL Fights Pollution!

HOW QUICKLY THE FRAMEWORK ON THESE HIGH RISES IS PUT UP ONCE THE FOUNDATION IS FINISHED.
DOESN'T TAKE LONG. I WONDER HOW MANY TONS OF STEEL GO INTO A SKELETON LIKE THAT?

JIMMY AND CARLA ARE IN THE SAME SCHOOL GRADE. THEY ARE GOING TO THE LIBRARY FOR REFERENCE BOOKS ON ECOLOGY—THE RELATIONSHIP BETWEEN LIVING THINGS AND THEIR ENVIRONMENT.

I IMAGINE THAT THE MAKING OF SO MUCH STEEL MUST HAVE A MAJOR EFFECT ON THE ENVIRONMENT.
IT'S BOUND TO UNLESS THE STEEL COMPANIES ARE DOING SOMETHING ABOUT IT.



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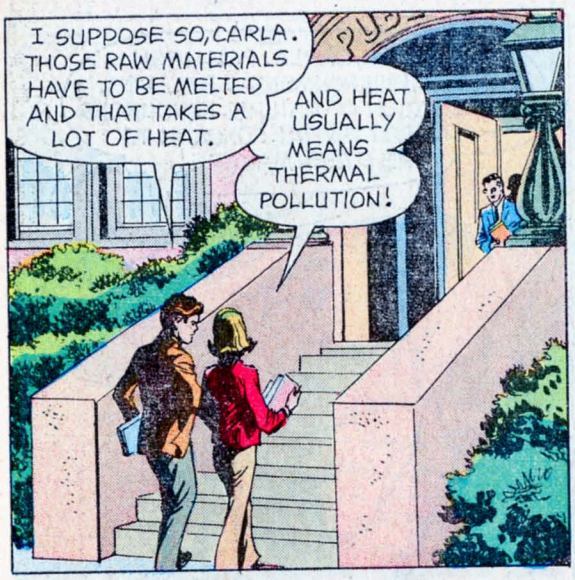
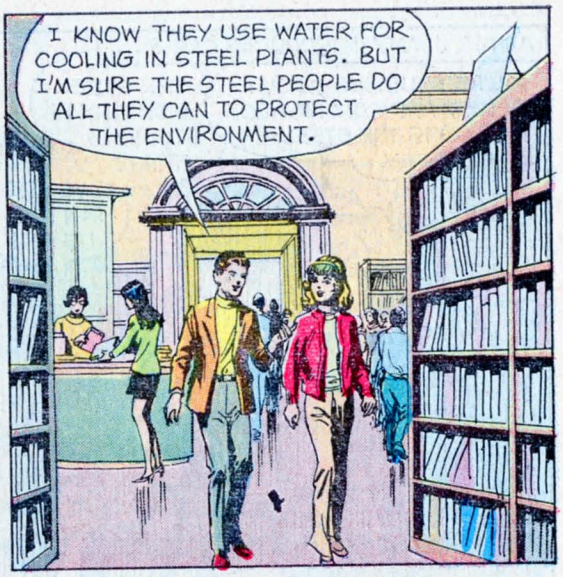
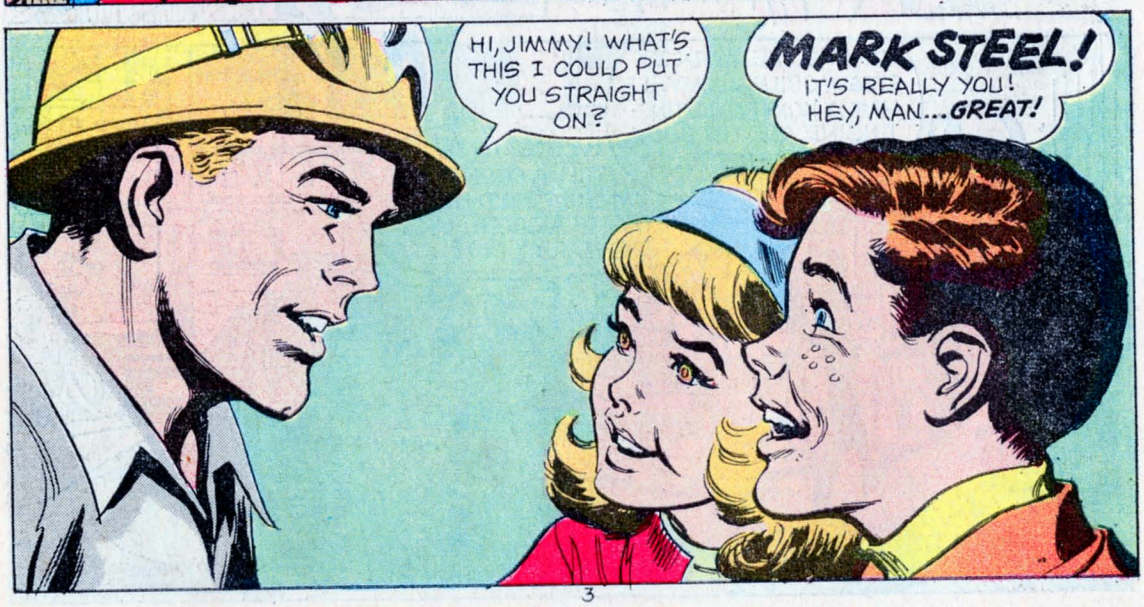

I SUPPOSE SO, CARLA. THOSE RAW MATERIALS HAVE TO BE MELTED AND THAT TAKES A LOT OF HEAT.
AND HEAT USUALLY MEANS THERMAL POLLUTION!

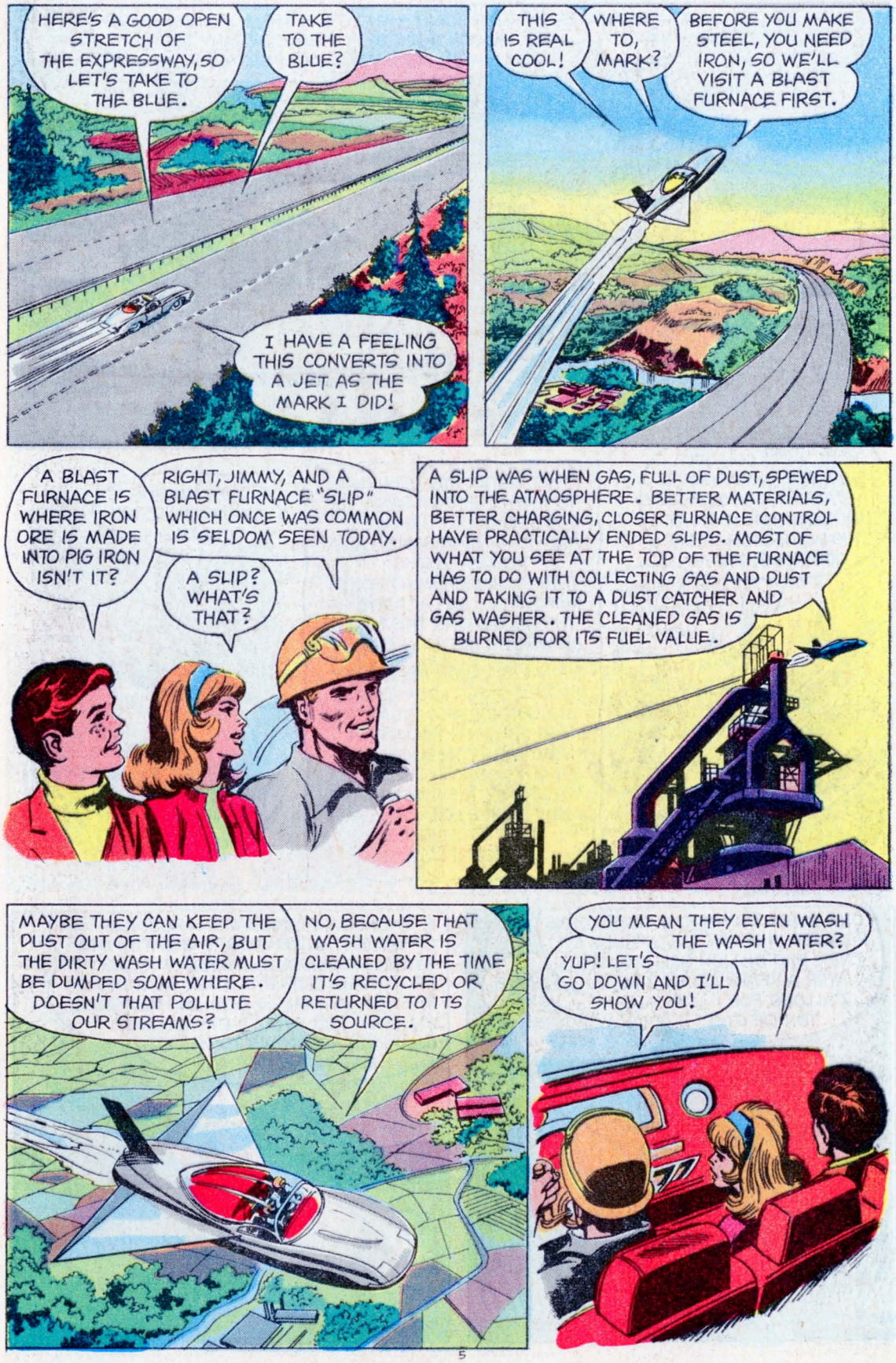


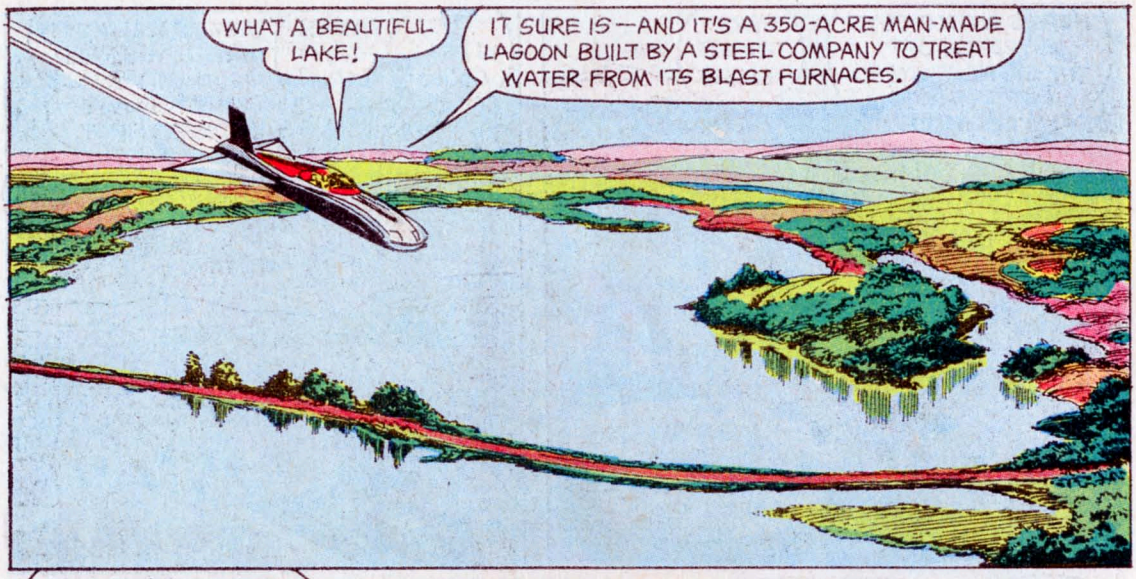
YOU'RE REALLY KEEN ON THE STEEL INDUSTRY, AREN'T YOU, JIMMY?
YEP... EVER SINCE THAT HAPPENING I TOLD YOU ABOUT. HOW COULD I FORGET THAT?

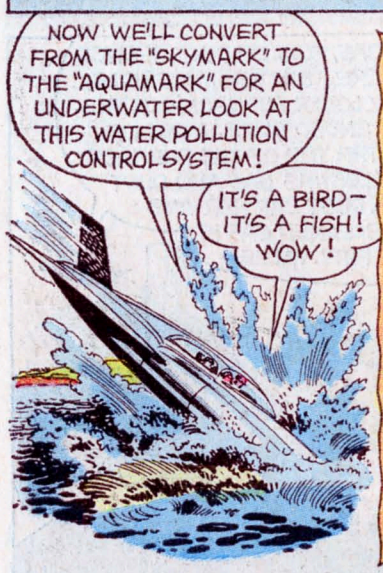
*JIMMY IS REFERRING TO "JOURNEY OF DISCOVERY WITH MARK STEEL"—A COMIC BOOK PUBLISHED BY AMERICAN IRON AND STEEL INSTITUTE.



AFTER JIMMY INTRODUCES CARLA...
YOU'RE STUDYING ABOUT ECOLOGY AND CONSERVATION, EH? SO IS THE STEEL INDUSTRY.
THE STEEL INDUSTRY IS STUDYING THAT?
YOU'RE PUTTING US ON!
NOT AT ALL, CARLA. POLLUTION CONTROL, ENVIRONMENTAL BALANCE, CONSERVATION OF NATURAL RESOURCES —ALL ARE OF VITAL CONCERN TO THE STEEL MAKERS!
FOR ONE THING, STEEL PEOPLE ARE JUST LIKE EVERYBODY ELSE. THEY WANT TO BREATHE CLEAN AIR AND LIVE IN NON-POLLUTED COMMUNITIES, AND FISH, AND SWIM, AND GROW THINGS, AND...
OF COURSE! JUST AS WE ALL DO.
STEEL PLANTS HAVE COME A LONG WAY FROM THE OLD, SMOKE-BELCHING DAYS. I'D LIKE TO SHOW YOU...
EXCUSE ME, BUT YOUR TALKING IS DISTURBING THE READERS.
I'M VERY SORRY, MA'AM. COME ON, KIDS. I HAVE A CAR OUTSIDE.
THAT'S THE MARK II STEELMOBILE, JIMMY. IT HAS A NON-POLLUTING ENGINE AND ITS BODY IS MADE OF RECYCLED STEEL!
WOWEE! IT'S STILL A COOL SET OF WHEELS—AND IT STILL ATTRACTS A CROWD LIKE THE MARK I DID!


HERE'S A GOOD OPEN STRETCH OF THE EXPRESSWAY, SO LET'S TAKE TO THE BLUE.
TAKE TO THE BLUE?
I HAVE A FEELING THIS CONVERTS INTO A JET AS THE MARK I DID!
THIS IS REAL COOL!
WHERE TO, MARK?
BEFORE YOU MAKE STEEL, YOU NEED IRON, SO WE'LL VISIT A BLAST FURNACE FIRST.
A BLAST FURNACE IS WHERE IRON ORE IS MADE INTO PIG IRON ISN'T IT?
RIGHT, JIMMY, AND A BLAST FURNACE "SLIP" WHICH ONCE WAS COMMON IS SELDOM SEEN TODAY.
A SLIP? WHAT'S THAT?
A SLIP WAS WHEN GAS, FULL OF DUST, SPEWED INTO THE ATMOSPHERE. BETTER MATERIALS, BETTER CHARGING, CLOSER FURNACE CONTROL HAVE PRACTICALLY ENDED SLIPS. MOST OF WHAT YOU SEE AT THE TOP OF THE FURNACE HAS TO DO WITH COLLECTING GAS AND DUST AND TAKING IT TO A DUST CATCHER AND GAS WASHER. THE CLEANED GAS IS BURNED FOR ITS FUEL VALUE.
MAYBE THEY CAN KEEP THE DUST OUT OF THE AIR, BUT THE DIRTY WASH WATER MUST BE DUMPED SOMEWHERE. DOESN'T THAT POLLUTE OUR STREAMS?
NO, BECAUSE THAT WASH WATER IS CLEANED BY THE TIME IT'S RECYCLED OR RETURNED TO ITS SOURCE.
YOU MEAN THEY EVEN WASH THE WASH WATER?
YUP! LET'S GO DOWN AND I'LL SHOW YOU!

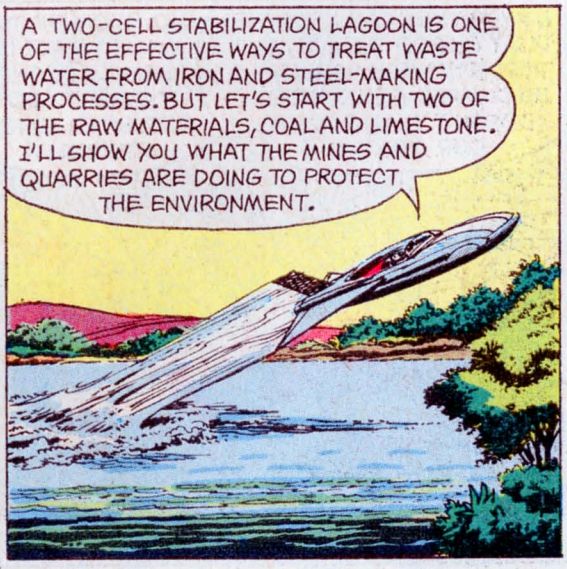

WHAT A BEAUTIFUL LAKE!
IT SURE IS—AND IT'S A 350-ACRE MAN-MADE LAGOON BUILT BY A STEEL COMPANY TO TREAT WATER FROM ITS BLAST FURNACES.

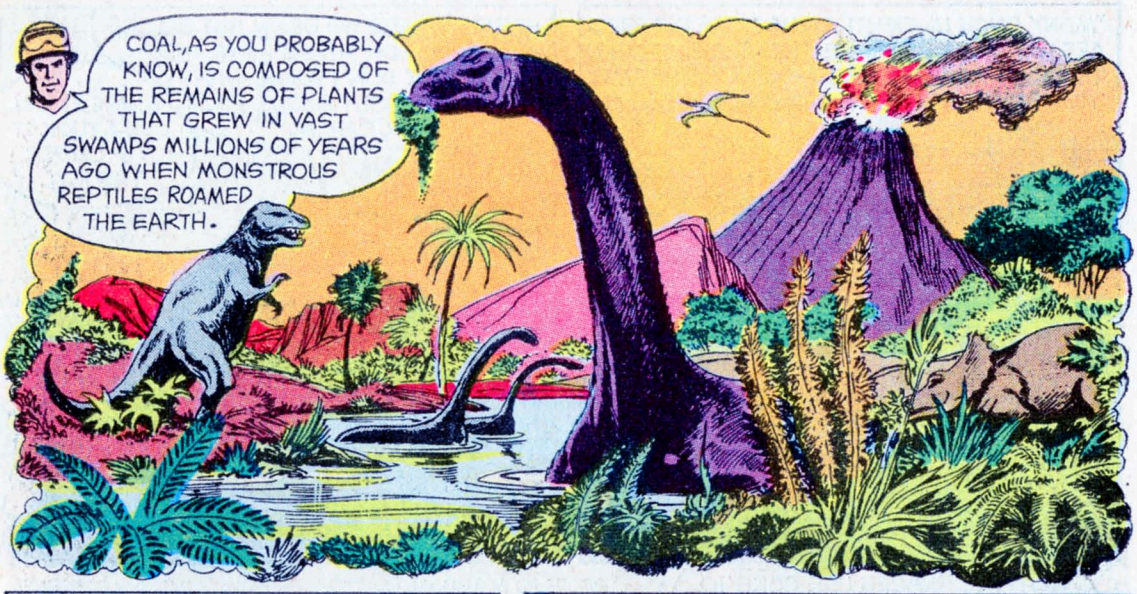

NOW WE'LL CONVERT FROM THE "SKYMARK" TO THE "AQUAMARK" FOR AN UNDERWATER LOOK AT THIS WATER POLLUTION CONTROL SYSTEM!
IT'S A BIRD—IT'S A FISH! WOW!

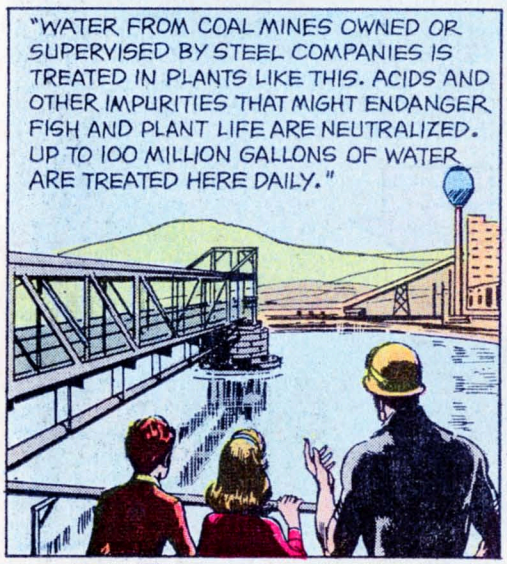
"THIS WATER HAS BEEN USED TO WASH FURNACE GASES OF DUST, TO COOL FURNACES, AND TO REMOVE SCALE FROM ROLLED STEEL.
THREE OIL-SKIMMING PONDS REMOVE ALL BUT A TRACE OF THE OIL BEFORE THE WATER FLOWS INTO SETTLING BASINS.

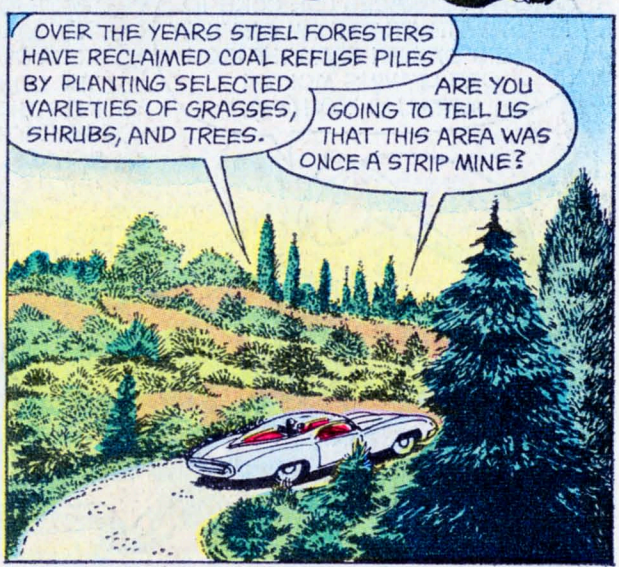
SAMPLES TAKEN REGULARLY FROM VARIOUS LOCATIONS IN THE LAGOON SHOW THAT THIS CAREFUL ANTI-POLLUTION TREATMENT RESULTS IN A STEADY SOURCE OF CLEANER WATER FOR THE STEEL PLANT AND FOR THE LOCAL STREAMS THAT RECEIVE THE OVERFLOW.

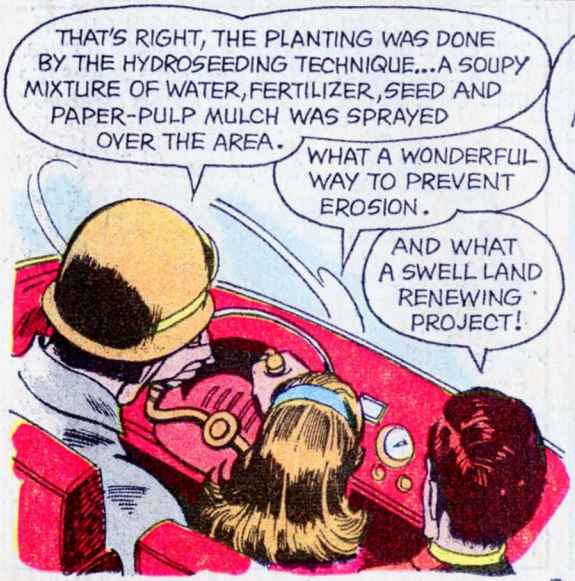
ONE STEEL COMPANY'S OPERATIONS REQUIRE THE USE AND RE-USE OF OVER 550 BILLION GALLONS OF WATER A YEAR—ABOUT 27,300 GALLONS FOR EACH TON OF STEEL!
THAT'S A HEAP OF MOISTURE FOR SURE!

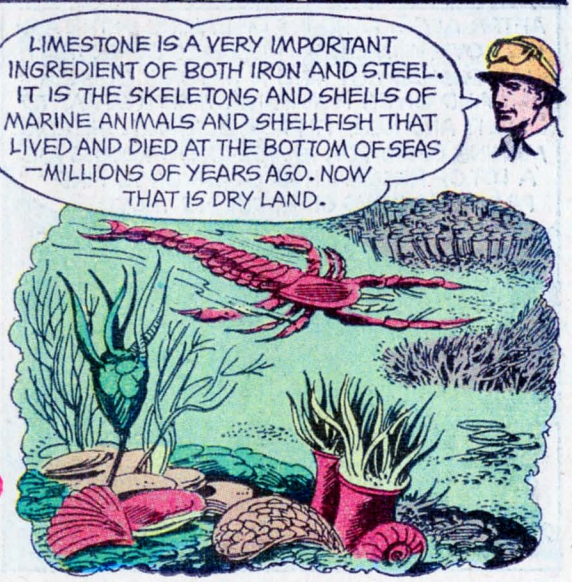

A TWO-CELL STABILIZATION LAGOON IS ONE OF THE EFFECTIVE WAYS TO TREAT WASTE WATER FROM IRON AND STEEL-MAKING PROCESSES. BUT LET'S START WITH TWO OF THE RAW MATERIALS, COAL AND LIMESTONE. I'LL SHOW YOU WHAT THE MINES AND QUARRIES ARE DOING TO PROTECT THE ENVIRONMENT.


COAL, AS YOU PROBABLY KNOW, IS COMPOSED OF THE REMAINS OF PLANTS THAT GREW IN VAST SWAMPS MILLIONS OF YEARS AGO WHEN MONSTROUS REPTILES ROAMED THE EARTH.


"WATER FROM COAL MINES OWNED OR SUPERVISED BY STEEL COMPANIES IS TREATED IN PLANTS LIKE THIS. ACIDS AND OTHER IMPURITIES THAT MIGHT ENDANGER FISH AND PLANT LIFE ARE NEUTRALIZED. UP TO 100 MILLION GALLONS OF WATER ARE TREATED HERE DAILY."


OVER THE YEARS STEEL FORESTERS HAVE RECLAIMED COAL REFUSE PILES BY PLANTING SELECTED VARIETIES OF GRASSES, SHRUBS, AND TREES.
ARE YOU GOING TO TELL US THAT THIS AREA WAS ONCE A STRIP MINE?


THAT'S RIGHT, THE PLANTING WAS DONE BY THE HYDROSEEDING TECHNIQUE...A SOUPY MIXTURE OF WATER, FERTILIZER, SEED AND PAPER-PULP MULCH WAS SPRAYED OVER THE AREA.
WHAT A WONDERFUL WAY TO PREVENT EROSION.
AND WHAT A SWELL LAND RENEWING PROJECT!


LIMESTONE IS A VERY IMPORTANT INGREDIENT OF BOTH IRON AND STEEL. IT IS THE SKELETONS AND SHELLS OF MARINE ANIMALS AND SHELLFISH THAT LIVED AND DIED AT THE BOTTOM OF SEAS —MILLIONS OF YEARS AGO. NOW THAT IS DRY LAND.

"MANY ONCE UNSIGHTLY LIMESTONE QUARRIES ARE NOW POPULAR RECREATION AREAS BECAUSE THE LAND WAS RECLAIMED—WHILE AT THE SAME TIME QUARRYING OPERATIONS CONTINUED."

HERE'S WHERE WE BEGIN, BUT BEFORE WE DO, PUT ON THESE HATS AND SCARVES. I DON'T KNOW WHAT YOU'LL DO ABOUT ABOUT YOUR HAIR, CARLA.

SIMPLE! I'LL JUST TUCK IT UP UNDER THE HAT.

BLAST FURNACES USE COKE TO REACT WITH AIR TO FORM GAS THAT TAKES OXYGEN FROM THE IRON ORE LEAVING MOLTEN METALLIC IRON (Fe).

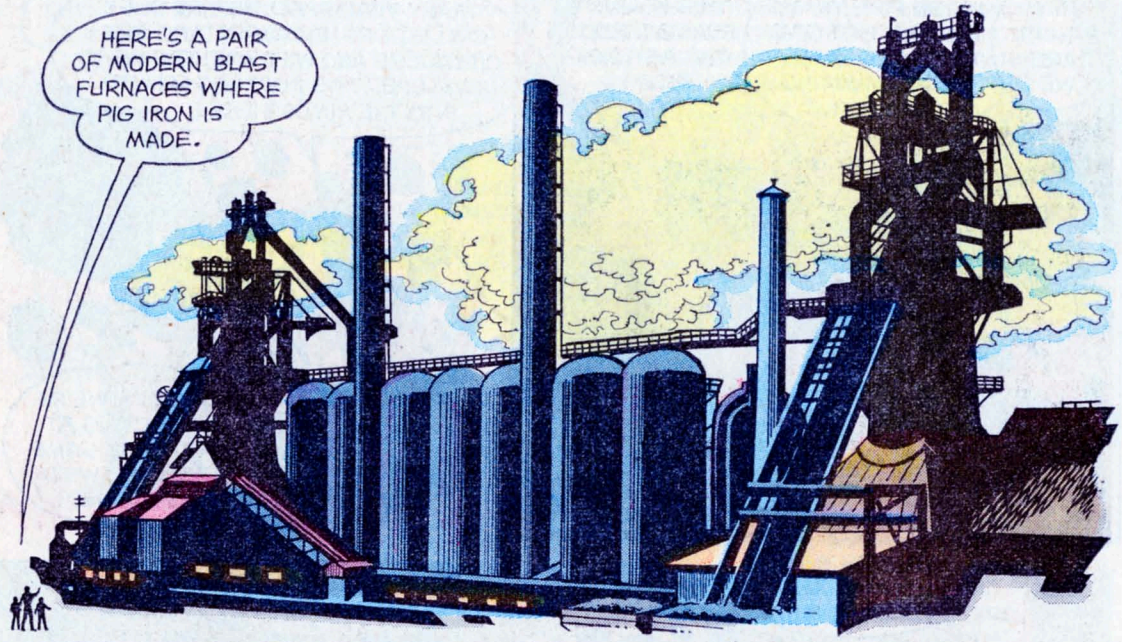
"COKE IS MADE IN BATTERIES OF OVENS LIKE THESE. THE COAL IS HOISTED UP TO THAT CHARGING BIN. IT IS THEN DROPPED INTO A CHARGING CAR WHICH TRAVELS THE LENGTH OF THE BATTERY DUMPING ITS LOAD INTO THE TOP OF OVEN EMPTIED A SHORT TIME EARLIER."

AFTER ABOUT 17 HOURS OF BAKING IN THE AIR-LESS OVENS, THE COAL BECOMES COKE. THEN IT'S PUSHED OUT INTO A WAITING QUENCH CAR AND GIVEN A MASSIVE WATER SPRAY TO COOL IT AND KEEP IT FROM BURNING. THE COKE MAKING OPERATION IS A SMOKEY PROCESS AND A LOT OF RESEARCH IS GOING ON TO FIND PRACTICAL WAYS OF REDUCING THOSE EMISSIONS.

THE GASES, OILS AND TARS DRIVEN OUT OF THE COAL ARE CAPTURED AND PIPED TO THE CHEMICAL PLANTS WHERE THEY ARE SEPARATED INTO VARIOUS COMPOUNDS TO MAKE FAMILIAR PRODUCTS LIKE:

AVIATION FUEL
DYES
PLASTICS
NYLONS
PERFUMES
MEDICINES
PRINTING INKS
RECORDS
INSECTICIDES

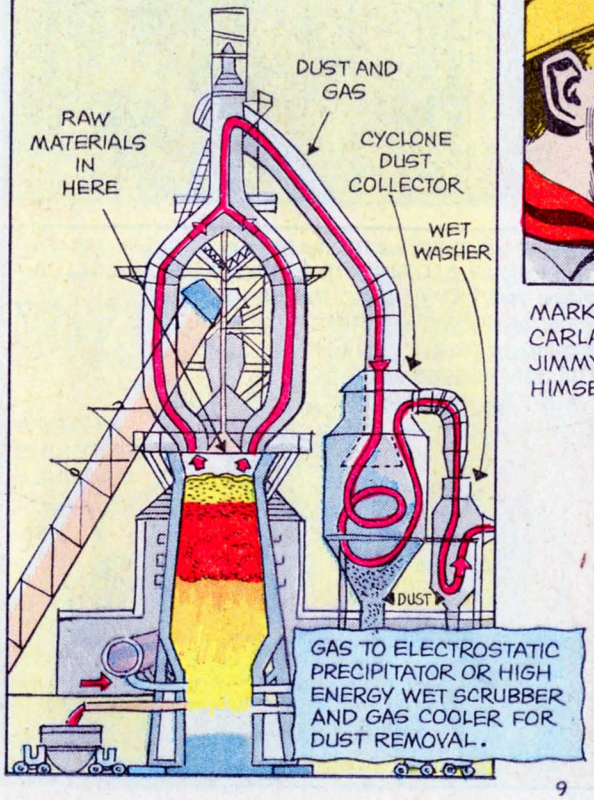
PHOTO DEVELOPERS—LACQUERS—AND MANY MORE!



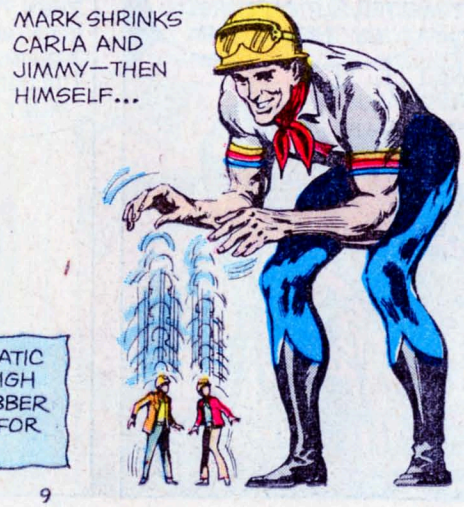
"CAREFULLY MEASURED AMOUNTS OF ORE, COKE AND LIMESTONE ARE FED INTO THE FURNACE TOGETHER.

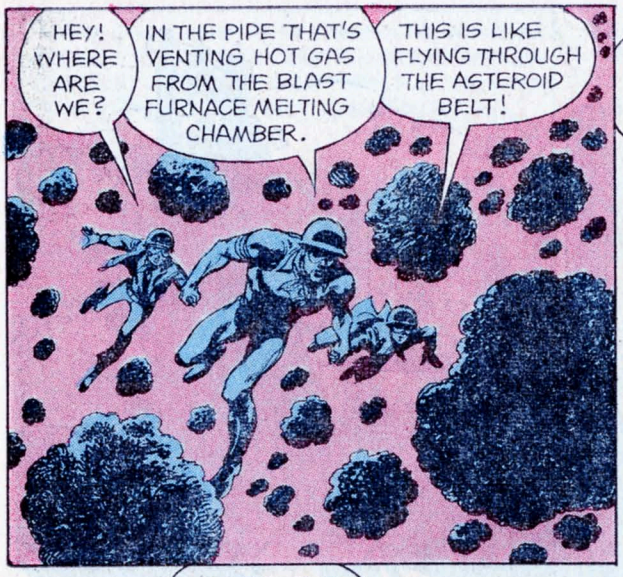
AS IT BECOMES HEATED, THE HEAVY MOLTEN METAL SETTLES TO THE BOTTOM AND IS DRAWN OFF INTO BOTTLE CARS, OR LADLES TO BE MADE INTO STEEL.

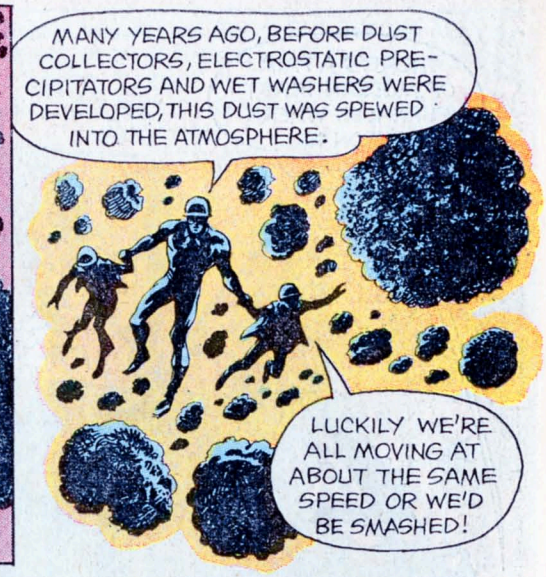
WHEN IT'S POURED INTO MOLDS IT'S CALLED 'PIG IRON!'"


DUST AND GAS
RAW MATERIALS IN HERE
CYCLONE DUST COLLECTOR
WET WASHER
DUST
GAS TO ELECTROSTATIC PRECIPITATOR OR HIGH ENERGY WET SCRUBBER AND GAS COOLER FOR DUST REMOVAL.

SINCE YOUR MAIN INTEREST IS IN POLLUTION CONTROL, HOW'D YOU LIKE TO ACTUALLY GO THROUGH AN ANTI-POLLUTION PROCESS?
YOU MEAN—AS THOUGH WE WERE SPECKS OF DUST?
HE CAN DO IT, TOO! WE'LL BE NO BIGGER THAN A GNAT'S EYE.



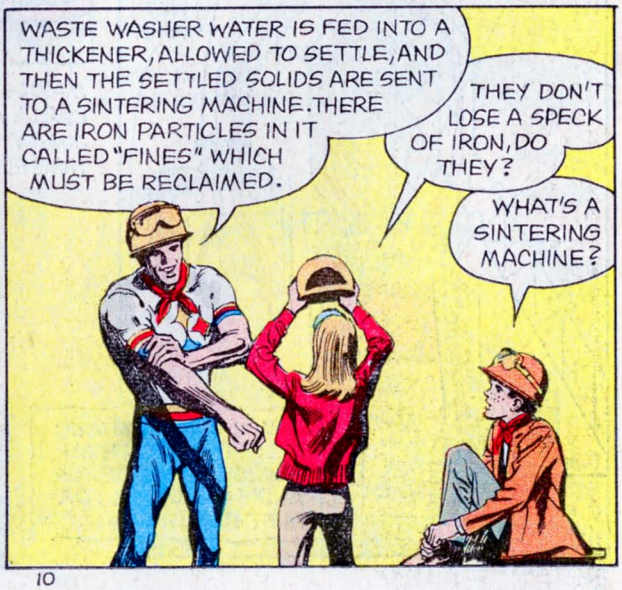

HEY! WHERE ARE WE?
IN THE PIPE THAT'S VENTING HOT GAS FROM THE BLAST FURNACE MELTING CHAMBER.
THIS IS LIKE FLYING THROUGH THE ASTEROID BELT!


MANY YEARS AGO, BEFORE DUST COLLECTORS, ELECTROSTATIC PRECIPITATORS AND WET WASHERS WERE DEVELOPED, THIS DUST WAS SPEWED INTO THE ATMOSPHERE.
LUCKILY WE'RE ALL MOVING AT ABOUT THE SAME SPEED OR WE'D BE SMASHED!

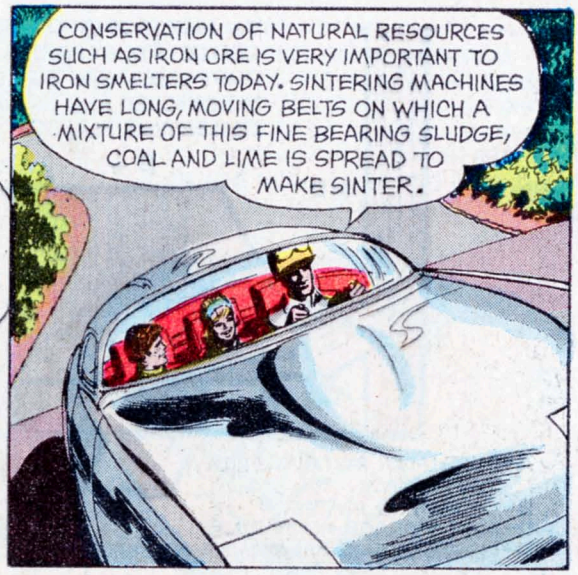
THIS IS THE CYCLONE DUST COLLECTOR!

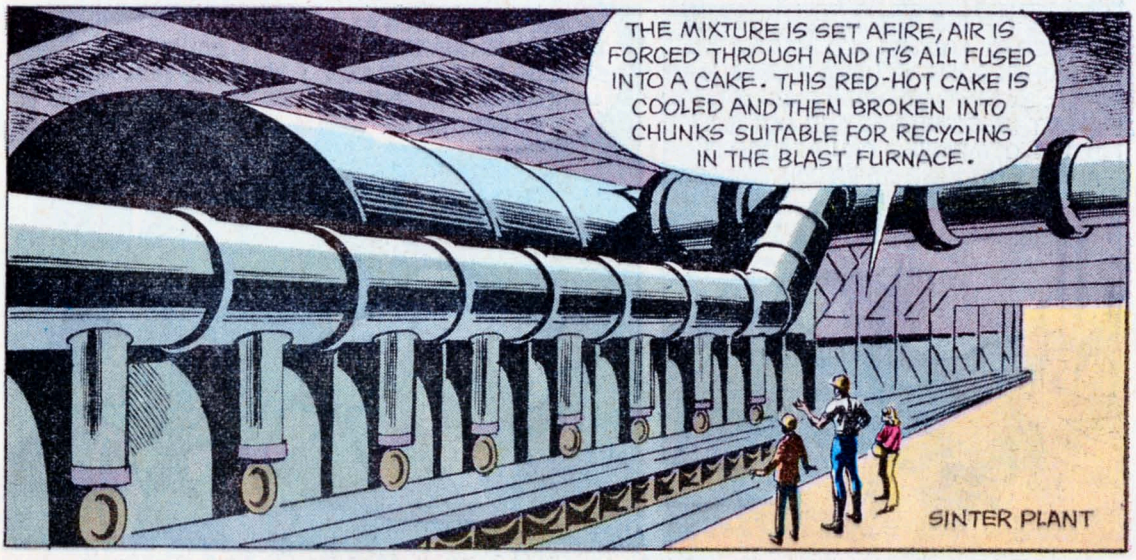
THIS IS THE WET WASHER.
IT'S NOT A DRY WASH!
THAT'S FOR SURE!

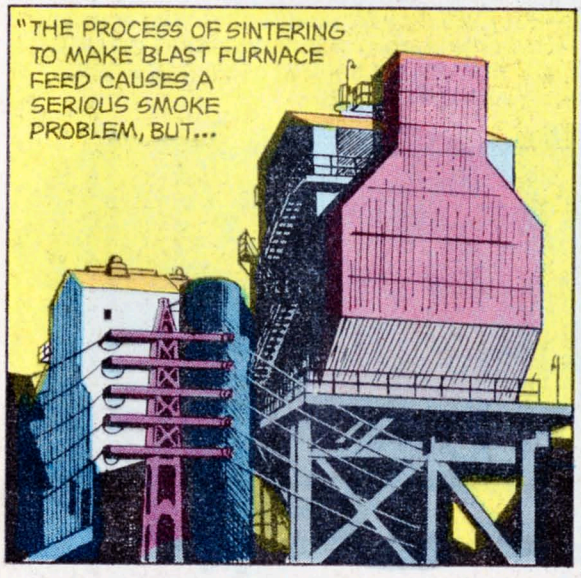
THIS IS SLUDGE-DUST AND FINE IRON-BEARING PARTICLES THAT WEREN'T MELTED, BUT CAPTURED BY THE WASHER.
WHAT'S DONE WITH THIS WET WASHER WATER?


WASTE WASHER WATER IS FED INTO A THICKENER, ALLOWED TO SETTLE, AND THEN THE SETTLED SOLIDS ARE SENT TO A SINTERING MACHINE. THERE ARE IRON PARTICLES IN IT CALLED "FINES" WHICH MUST BE RECLAIMED.
THEY DON'T LOSE A SPECK OF IRON, DO THEY?
WHAT'S A SINTERING MACHINE?

LET'S GET BACK TO NORMAL SIZE AND I'LL SHOW YOU A SINTER BEING MADE.
SNAP!
HEY, JIMMY! COME ON—GROW UP!
I WAS WAITING TO SEE WHAT HUMANS LOOK LIKE TO A GNAT!

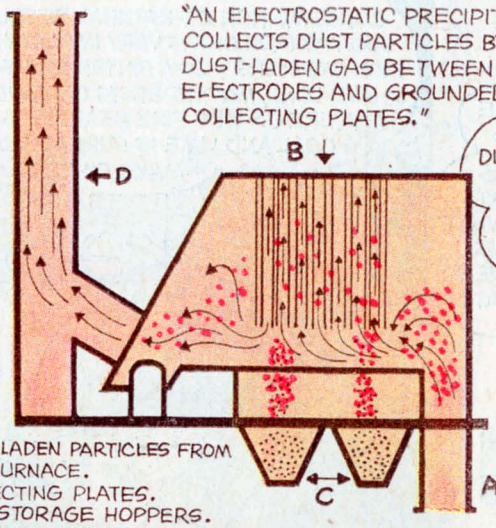

CONSERVATION OF NATURAL RESOURCES SUCH AS IRON ORE IS VERY IMPORTANT TO IRON SMELTERS TODAY. SINTERING MACHINES HAVE LONG, MOVING BELTS ON WHICH A MIXTURE OF THIS FINE BEARING SLUDGE, COAL AND LIME IS SPREAD TO MAKE SINTER.


THE MIXTURE IS SET AFIRE, AIR IS FORCED THROUGH AND IT'S ALL FUSED INTO A CAKE. THIS RED-HOT CAKE IS COOLED AND THEN BROKEN INTO CHUNKS SUITABLE FOR RECYCLING IN THE BLAST FURNACE.
SINTER PLANT


"THE PROCESS OF SINTERING TO MAKE BLAST FURNACE FEED CAUSES A SERIOUS SMOKE PROBLEM, BUT...

...WITH ELECTROSTATIC PRECIPITATORS OR HIGH ENERGY WET SCRUBBERS, OR BAG HOUSE CLEANING SYSTEMS, AND SOMETIMES ALL THREE, PROGRESS IS BEING MADE TOWARD COMPLETE CONTROL.
WHAT'S AN ELECTRO-WHATCHA-MA-CALL-IT?

"AN ELECTROSTATIC PRECIPITATOR COLLECTS DUST PARTICLES BY PASSING DUST-LADEN GAS BETWEEN NEGATIVE ELECTRODES AND GROUNDED METAL COLLECTING PLATES."



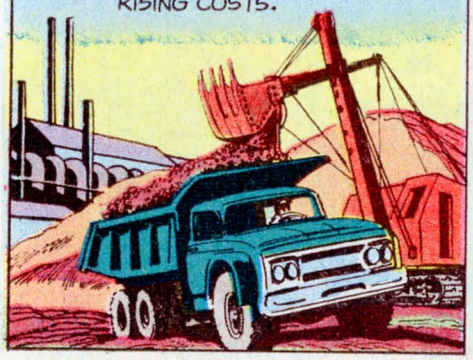
A-DUST-LADEN PARTICLES FROM THE FURNACE.
B-COLLECTING PLATES.
C-DUST STORAGE HOPPERS.
D-CLEANSED GASES ARE DISCHARGED THROUGH STACK.

THEN THE DUST PARTICLES MUST BE NEGATIVE CHARGED, RIGHT?

RIGHT, JIMMY, AND BECAUSE A CHARGE IS ATTRACTED TO GROUND, THE DUST PARTICLES ARE COLLECTED ONTO THE PLATES. THEN AN AUTOMATIC RAPPING SYSTEM, EVERY SO OFTEN, KNOCKS THE DUST OFF THE PLATES INTO THE HOPPERS.

WHAT'S DONE WITH ALL THE DUST THAT'S COLLECTED?

"SOME OF THE RECLAIMED DUST IS SINTERED AND REUSED IN IRON MAKING. SOME IS USED FOR LAND-FILL. BUT MODERN SINTERING EQUIPMENT IS EXPENSIVE AND NOT ALL STEEL COMPANIES CAN AFFORD IT ALONG WITH THEIR OTHER CONTINUOUSLY RISING COSTS.

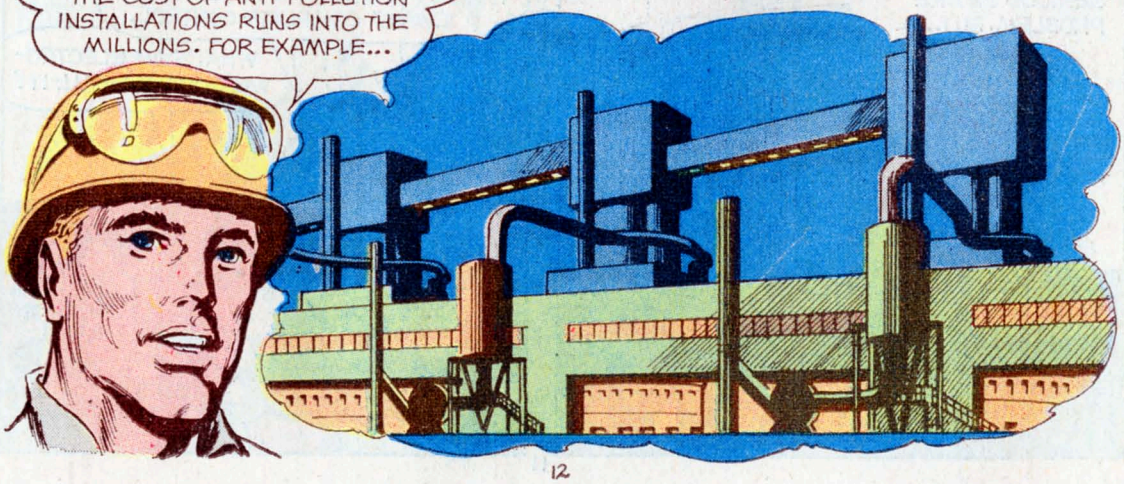


SOME COAL MINES AND LIMESTONE QUARRIES HAD SERIOUS DUST PROBLEMS WHICH ARE ALSO BEING CORRECTED.

I CAN'T HELP THINKING HOW MUCH THIS DUST COLLECTING PROGRAM MUST BE COSTING THE INDUSTRY.

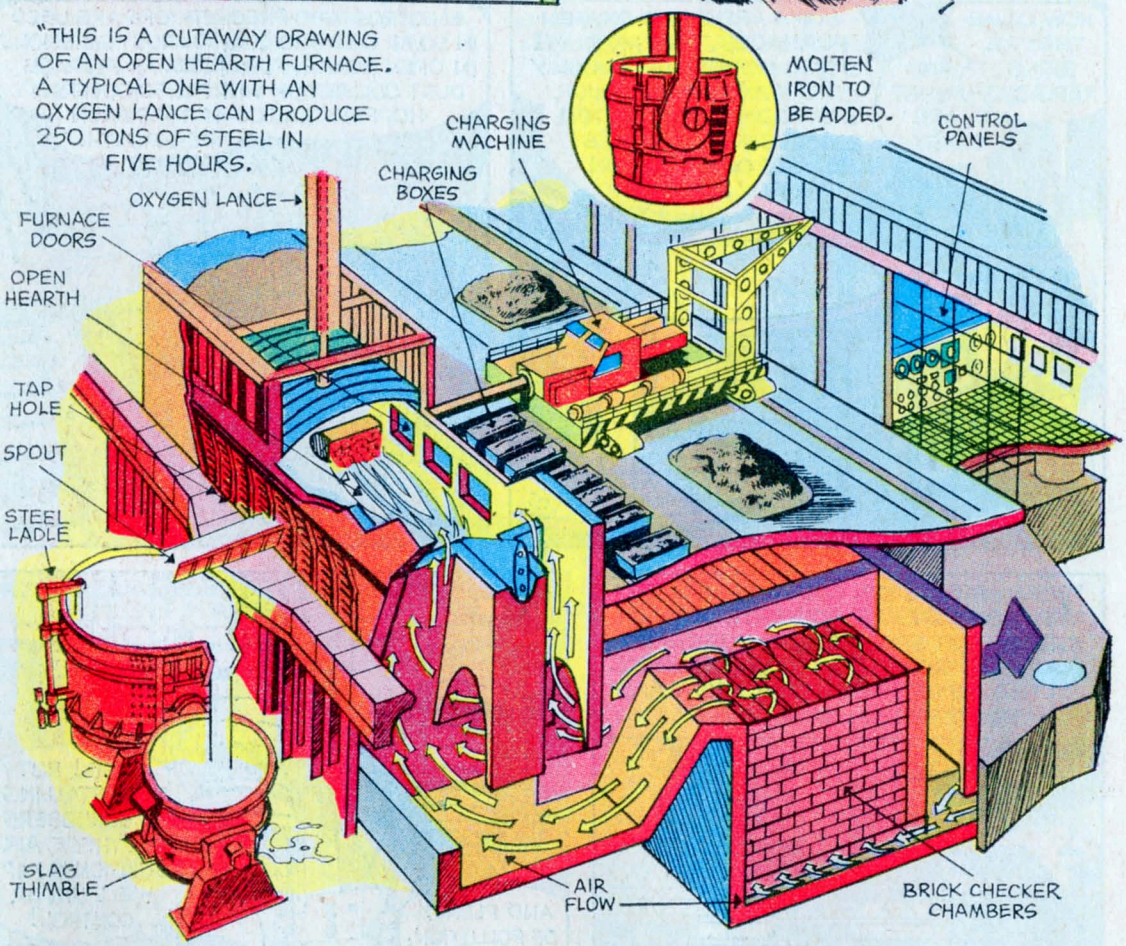
JIMMY, THERE ARE STEEL COMPANY TREASURERS AND AUDITORS LOSING SLEEP THINKING ABOUT THAT. THE COST OF ANTI-POLLUTION INSTALLATIONS RUNS INTO THE MILLIONS. FOR EXAMPLE...

"THE HIGH-ENERGY WET SCRUBBERS THAT CONTROL AIR POLLUTION DURING THE PROCESSING OF LIME-STONE IN ROTARY LIME KILNS COST THIS STEEL COMPANY ABOUT $1,000,000.

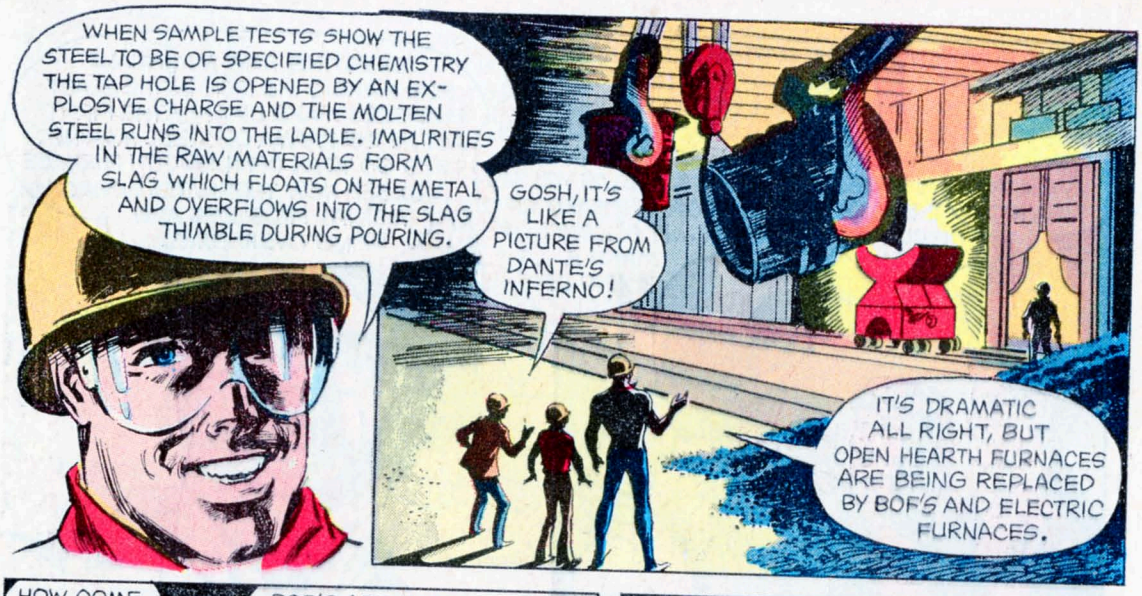


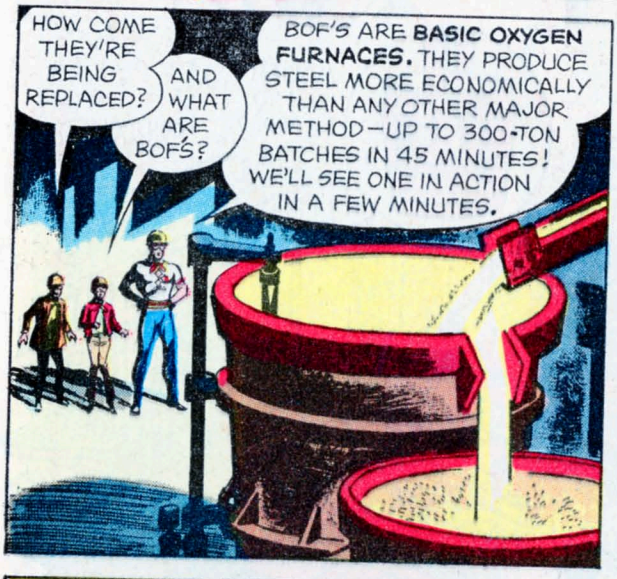
THOSE ELECTRO-STATIC DUST COLLECTORS MUST SET THE COMPANIES BACK A WAD, TOO.
AND ALL FOR THE SAKE OF CLEAN AIR!
ONE SYSTEM MIGHT EASILY COST HALF A MILLION DOLLARS AND THAT WOULD BE ONLY A FRACTION OF ALL THE POLLUTION CONTROL EQUIPMENT AND INSTALLATION COSTS. AS YOU SAY, IT'S ALL FOR THE SAKE OF CLEAN AIR... IT DOESN'T MAKE A POUND OF STEEL.
SUPPLYING RAW MATERIALS FOR MAKING PIG IRON IN THE BLAST FURNACES MAKE UP ONLY THE FIRST ACT IN THE DRAMA OF STEEL MAKING. LET'S GO TO AN OPEN HEARTH FURNACE AND SEE HOW THERE, TOO, ENVIRONMENTAL PROBLEMS ARE BEING OVERCOME.

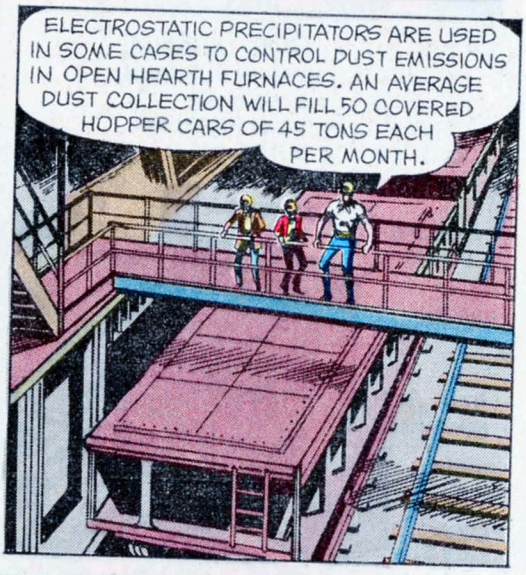
"THIS IS A CUTAWAY DRAWING OF AN OPEN HEARTH FURNACE. A TYPICAL ONE WITH AN OXYGEN LANCE CAN PRODUCE 250 TONS OF STEEL IN FIVE HOURS.

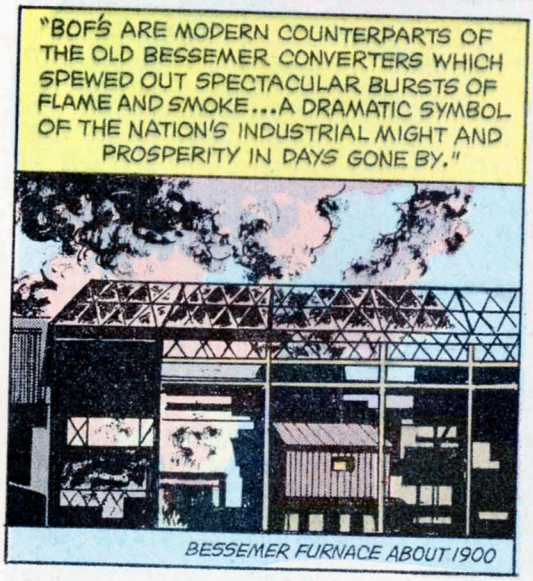


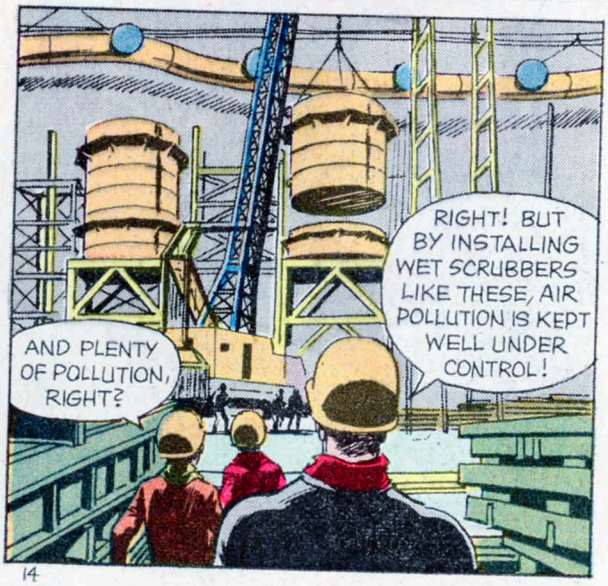
THE NORMAL FLOW OF PRODUCTION IS: (1) THE LONG-ARMED CHARGING MACHINE PICKS UP BOXES OF LIMESTONE AND STEEL SCRAP, PUSHES THEM THROUGH THE FURNACE DOORS AND DUMPS THE CONTENTS. (2) WHEN THIS CHARGE IS PARTIALLY MELTED, MOLTEN IRON IS POURED INTO THE FURNACE. (3) OXYGEN MAY BE FED IN THROUGH THE LANCE TO INCREASE FLAME TEMPERATURE WHICH SPEEDS MELTING.


WHEN SAMPLE TESTS SHOW THE STEEL TO BE OF SPECIFIED CHEMISTRY THE TAP HOLE IS OPENED BY AN EXPLOSIVE CHARGE AND THE MOLTEN STEEL RUNS INTO THE LADLE. IMPURITIES IN THE RAW MATERIALS FORM SLAG WHICH FLOATS ON THE METAL AND OVERFLOWS INTO THE SLAG THIMBLE DURING POURING.
GOSH, IT'S LIKE A PICTURE FROM DANTE'S INFERNO!
IT'S DRAMATIC ALL RIGHT, BUT OPEN HEARTH FURNACES ARE BEING REPLACED BY BOF'S AND ELECTRIC FURNACES.

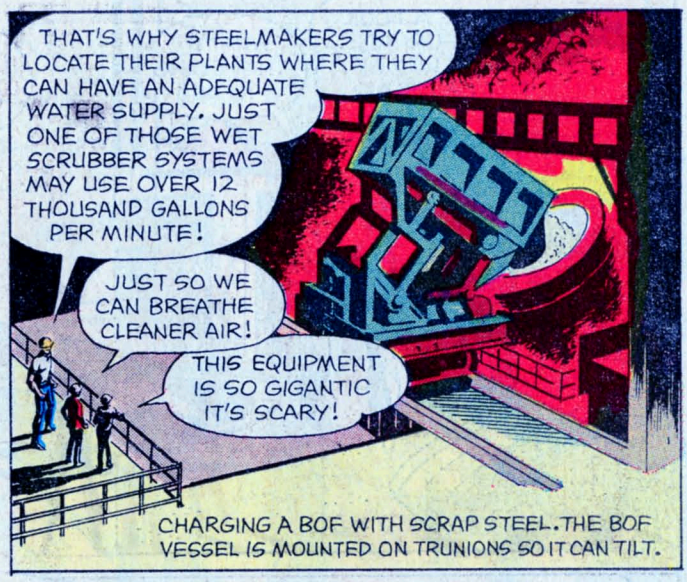

HOW COME THEY'RE BEING REPLACED?
AND WHAT ARE BOF'S?
BOF'S ARE **BASIC OXYGEN FURNACES.** THEY PRODUCE STEEL MORE ECONOMICALLY THAN ANY OTHER MAJOR METHOD—UP TO 300-TON BATCHES IN 45 MINUTES! WE'LL SEE ONE IN ACTION IN A FEW MINUTES.


ELECTROSTATIC PRECIPITATORS ARE USED IN SOME CASES TO CONTROL DUST EMISSIONS IN OPEN HEARTH FURNACES. AN AVERAGE DUST COLLECTION WILL FILL 50 COVERED HOPPER CARS OF 45 TONS EACH PER MONTH.


"BOF'S ARE MODERN COUNTERPARTS OF THE OLD BESSEMER CONVERTERS WHICH SPEWED OUT SPECTACULAR BURSTS OF FLAME AND SMOKE...A DRAMATIC SYMBOL OF THE NATION'S INDUSTRIAL MIGHT AND PROSPERITY IN DAYS GONE BY."
BESSEMER FURNACE ABOUT 1900


AND PLENTY OF POLLUTION, RIGHT?
RIGHT! BUT BY INSTALLING WET SCRUBBERS LIKE THESE, AIR POLLUTION IS KEPT WELL UNDER CONTROL!

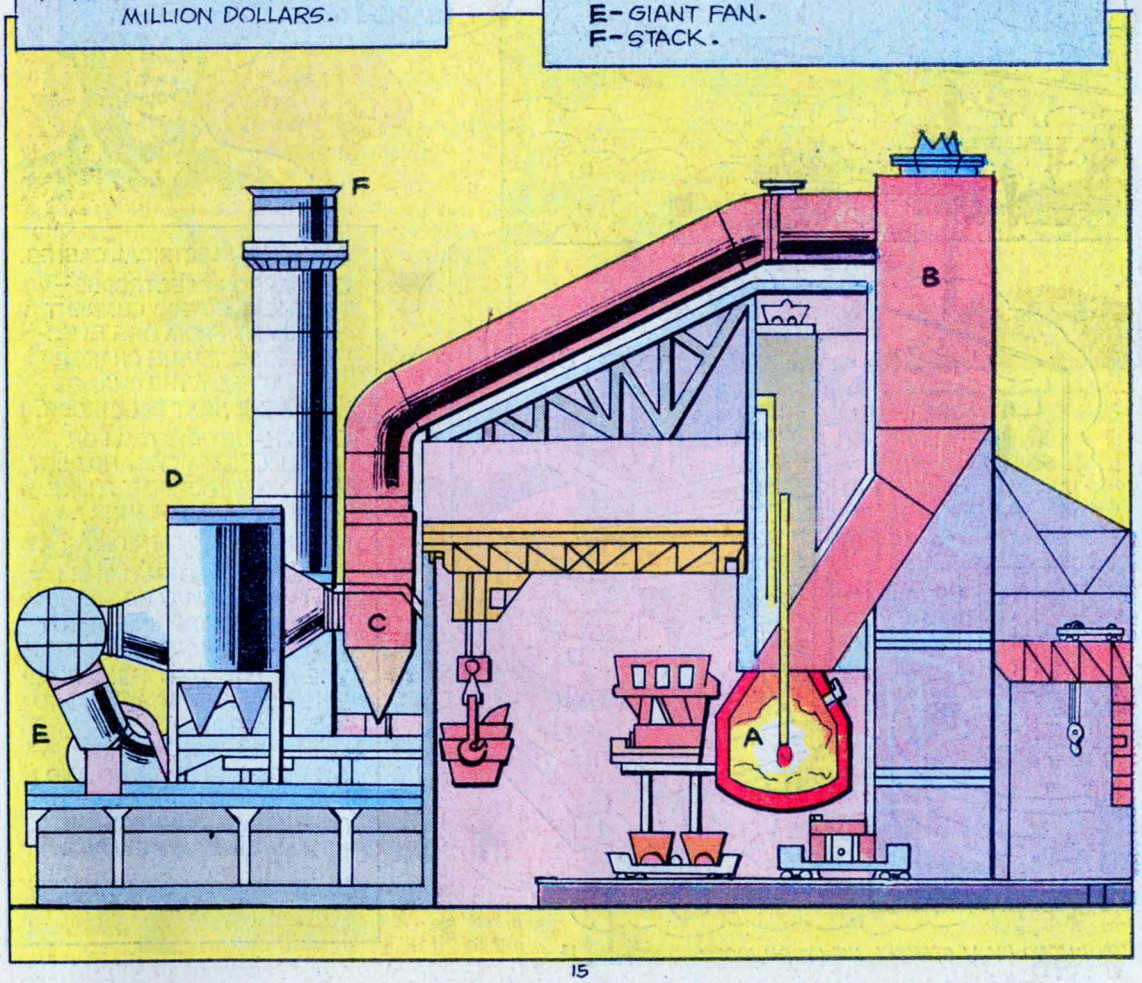
BACK TO WATER AGAIN! GOSH, IRON AND STEEL PLANTS CERTAINLY DEPEND ON PLENTY OF WATER IN THEIR OPERATIONS.

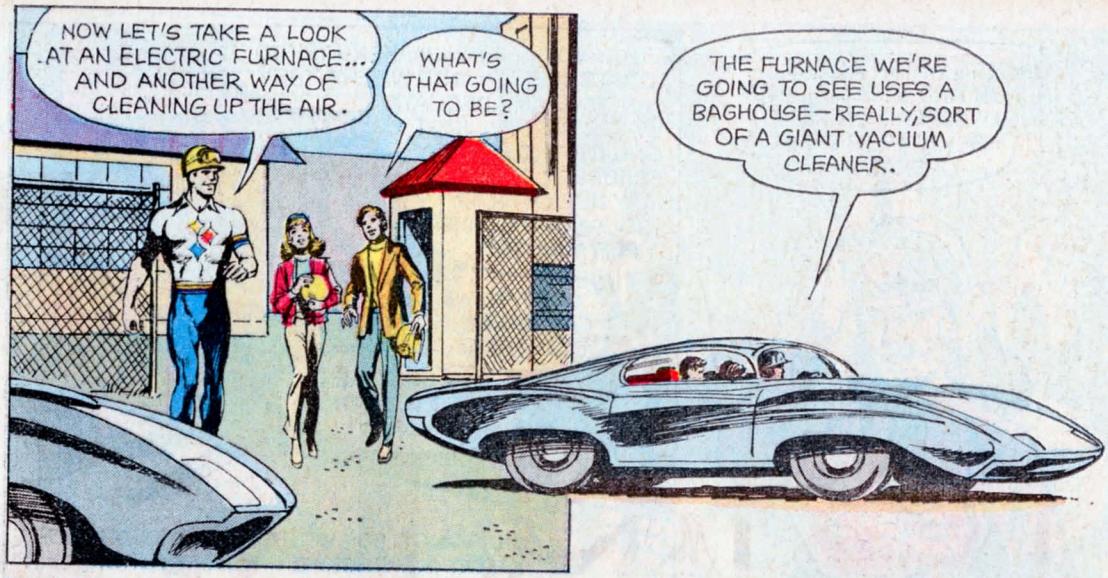

THAT'S WHY STEELMAKERS TRY TO LOCATE THEIR PLANTS WHERE THEY CAN HAVE AN ADEQUATE WATER SUPPLY. JUST ONE OF THOSE WET SCRUBBER SYSTEMS MAY USE OVER 12 THOUSAND GALLONS PER MINUTE!
JUST SO WE CAN BREATHE CLEANER AIR!
THIS EQUIPMENT IS SO GIGANTIC IT'S SCARY!

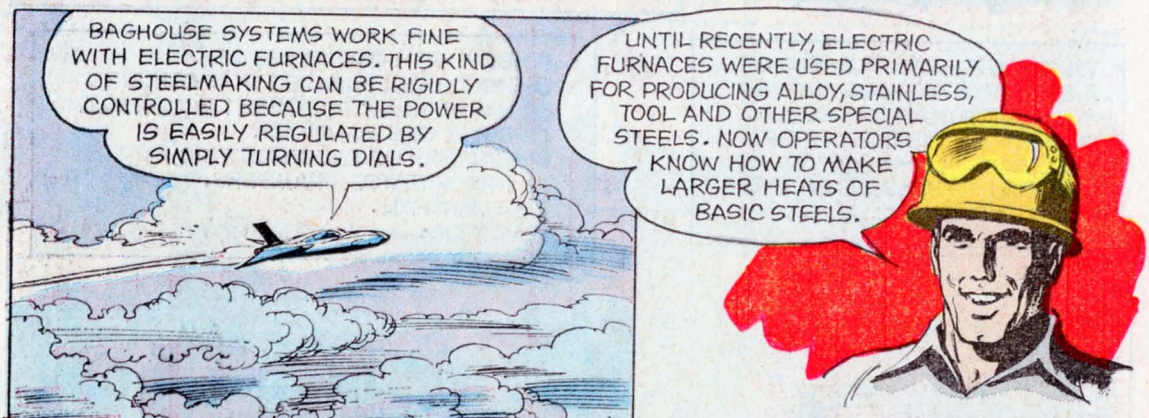
CHARGING A BOF WITH SCRAP STEEL. THE BOF VESSEL IS MOUNTED ON TRUNIONS SO IT CAN TILT.

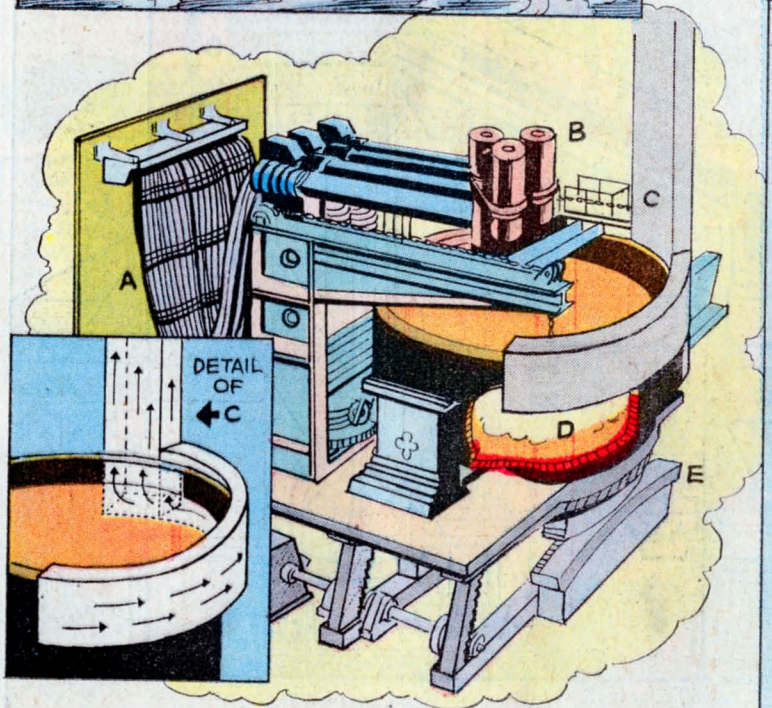
"THIS SCHEMATIC DRAWING OF A BOF FACILITY SHOWS ANOTHER METHOD OF CONTROLLING AIR POLLUTION: THE USE OF THE ELECTROSTATIC PRECIPITATORS AT A COST OF UPWARDS OF THREE MILLION DOLLARS.

A-BOF WITH OXYGEN LANCE.
B-HOOD OVER FURNACE THAT CONDUCTS GASES TO AIR TREATMENT EQUIPMENT.
C-DIRTY GAS MANIFOLD.
D-BATTERY OF ELECTROSTATIC PRECIPITATOR CHAMBERS.
E-GIANT FAN.
F-STACK.




NOW LET'S TAKE A LOOK AT AN ELECTRIC FURNACE... AND ANOTHER WAY OF CLEANING UP THE AIR.
WHAT'S THAT GOING TO BE?
THE FURNACE WE'RE GOING TO SEE USES A BAGHOUSE—REALLY, SORT OF A GIANT VACUUM CLEANER.


BAGHOUSE SYSTEMS WORK FINE WITH ELECTRIC FURNACES. THIS KIND OF STEELMAKING CAN BE RIGIDLY CONTROLLED BECAUSE THE POWER IS EASILY REGULATED BY SIMPLY TURNING DIALS.
UNTIL RECENTLY, ELECTRIC FURNACES WERE USED PRIMARILY FOR PRODUCING ALLOY, STAINLESS, TOOL AND OTHER SPECIAL STEELS. NOW OPERATORS KNOW HOW TO MAKE LARGER HEATS OF BASIC STEELS.



A—HEAVY ELECTRICAL CABLES.

B—CARBON ELECTRODES—THE ELECTRIC CURRENT JUMPS FROM ONE ELECTRODE TO THE CHARGE AND FROM THE CHARGE TO THE NEXT ELECTRODE.

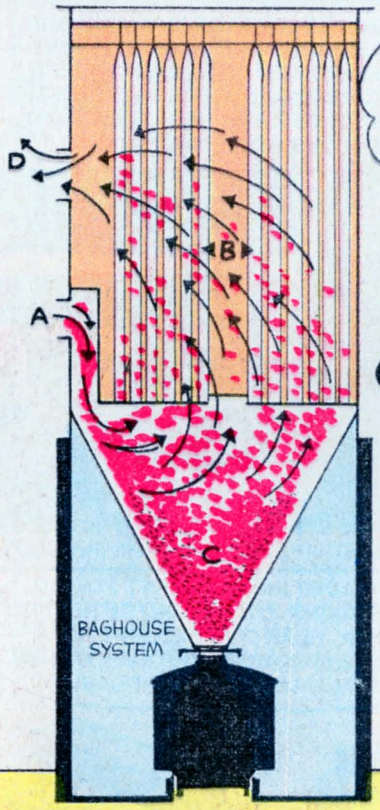
C—EXHAUST SYSTEM FOR PULLING SMOKE AND DUST TO THE BAGHOUSE. (LIKE A VACUUM CLEANER).

D—FURNACE INTERIOR.

E—ROCKER—SO THAT THE FURNACE MAY BE TILTED TOWARD TAPPING SPOUT FOR POURING.

THE ENTIRE TOP OF THE ELECTRIC FURNACE MAY SWING TO THE SIDE TO ALLOW THE CHARGING BOX OF SCRAP STEEL TO BE LOWERED AND DUMPED INTO FURNACE. IN THIS PARTICULAR FURNACE THE NEW STEEL CAN BE MADE ENTIRELY FROM SCRAP STEEL. RECYCLING ALL THE WAY!

PRODUCED BY AL STENZEL, NEW YORK, 10022



POLLUTED AIR IS BLOWN THROUGH A SERIES OF LARGE FILTER BAGS WHICH PERMIT ONLY CLEAN AIR TO RETURN TO THE ATMOSPHERE.

"A SYSTEM OF FANS, HOODS AND DAMPERS CARRIES DIRTY GASES TO THE BAGHOUSE WHERE PARTICLES AS SMALL AS ONE THOUSANDTH OF A MILLIMETER ARE REMOVED."

TAPPING AN ELECTRIC FURNACE.

A- DUST LADEN AIR FROM FURNACE.
B- FILTER BAGS
C- DUST DROPPING INTO STORAGE HOPPER
D- CLEANED AIR DISCHARGED TO ATMOSPHERE.

THERE ARE OTHER STEEL MAKING METHODS, BUT THESE WE HAVE VISITED ARE THE PRINCIPAL ONES. NOW, BEFORE WE GO TO A ROLLING MILL, LET'S HAVE LUNCH.

GOOD! I'M HUNGRY!

I WAS HOPING THAT BASKET IN THE CAR WAS FULL OF EATS!

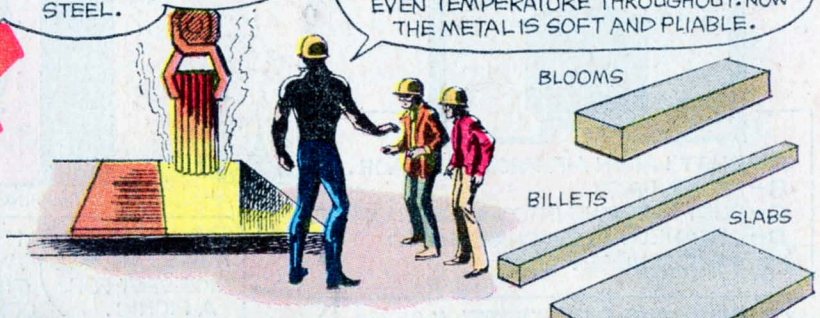
GOOD CHOW, MARK. AND A NICE SPOT FOR A PICNIC.

IT'S HARD TO BELIEVE THAT WE'RE VERY CLOSE TO A STEEL PLANT. THE PLANT IS CONSTANTLY USING THIS WATER, CLEANING IT AND PUTTING IT BACK.

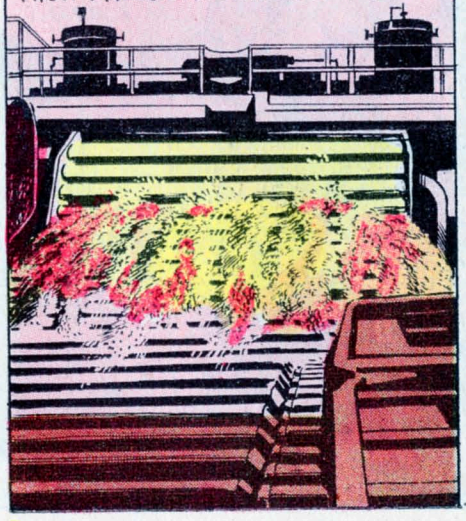
THE LOCAL PEOPLE MUST ENJOY THIS LAKE. I'LL BET THEY'RE GLAD THAT THE COMPANY CARES ABOUT THE ENVIRONMENT.

"MOST MOLTEN STEEL IS POURED OR 'TEEMED' INTO MOLDS OF VARYING SHAPES AND SIZES TO FORM INGOTS THAT ARE THEN ROLLED INTO SEMIFINISHED FORMS; THE MOST COMMON OF WHICH ARE BLOOMS, BILLETS AND SLABS. THESE ARE THEN ROLLED ON MILLS INTO VARIOUS STEEL PRODUCTS."

GIANT TONGS LIFT (OR "STRIP") THE MOLD FROM THE INGOT.

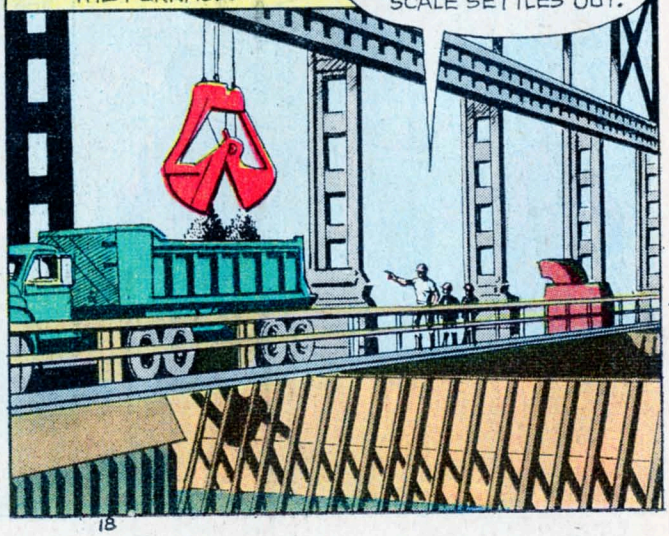

THE MOLDED INGOT IS FIRST PLACED IN A "SOAKING PIT"—A KIND OF HEATING FURNACE. HERE IT IS BROUGHT TO AN EVEN TEMPERATURE THROUGHOUT. NOW THE METAL IS SOFT AND PLIABLE.
BLOOMS
BILLETS
SLABS

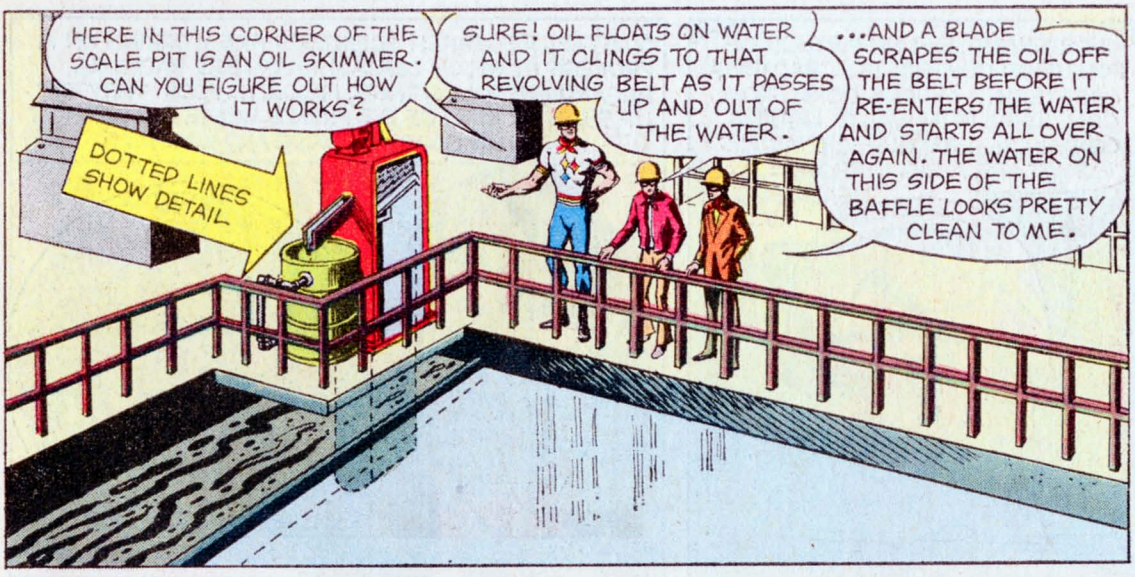
"IN THE PRIMARY ROLLING MILL THE HOT INGOT IS ROLLED TO THE DESIRED THICKNESS FOR THE NEXT ROLLING PROCESS. WHEN IT IS REHEATED FOR FINISH ROLLING, PARTICLES OF OXIDIZED STEEL FORM ON THE SURFACE. THIS SCALE IS BLASTED LOOSE BY HIGH-PRESSURE WATER SPRAYS."



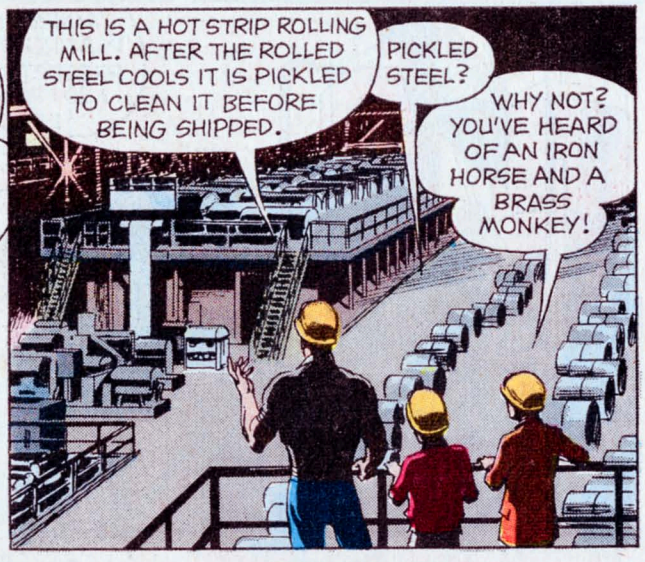
"SINCE MOST OF THE SCALE IS OF LARGE SIZE, IT SETTLES TO THE BOTTOM OF THE SCALE PIT AND IS REMOVED BY CONVEYOR OR CLAM SHELL BUCKET AND RECYCLED BACK THROUGH THE FURNACES."

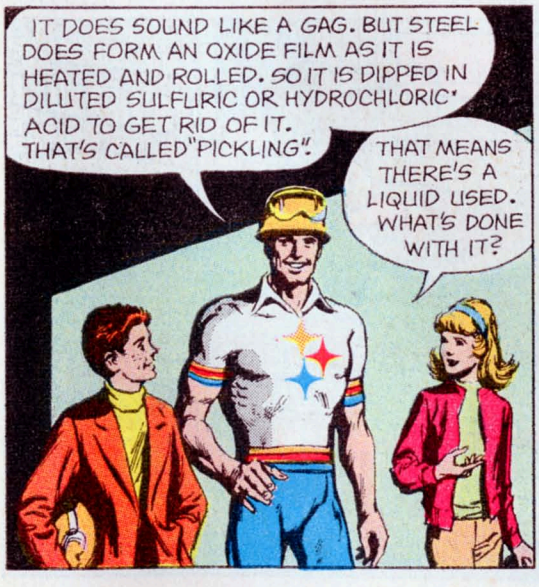
THE SCALE PIT WATER THEN FLOWS TO THE WET WELL AND IS PUMPED TO THREE SECONDARY PITS WHERE THE SMALLER SCALE SETTLES OUT.

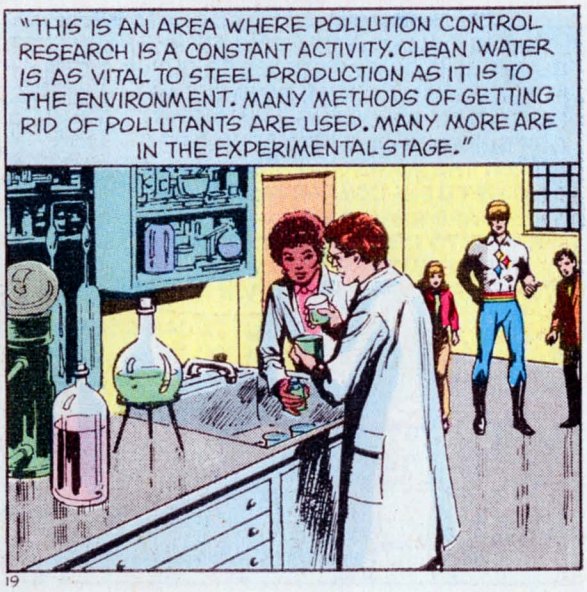


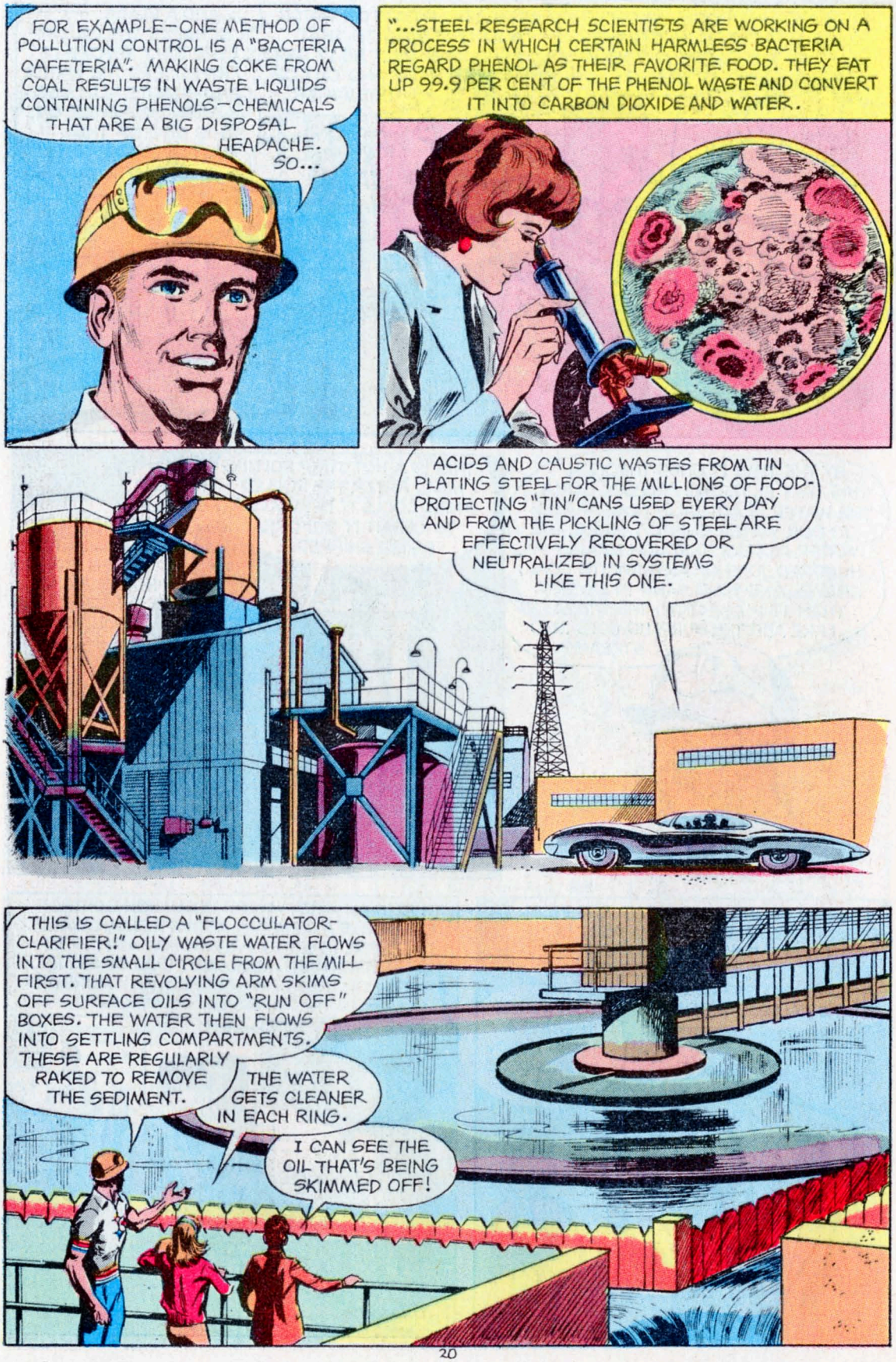

HERE IN THIS CORNER OF THE SCALE PIT IS AN OIL SKIMMER. CAN YOU FIGURE OUT HOW IT WORKS?
DOTTED LINES SHOW DETAIL
SURE! OIL FLOATS ON WATER AND IT CLINGS TO THAT REVOLVING BELT AS IT PASSES UP AND OUT OF THE WATER.
...AND A BLADE SCRAPES THE OIL OFF THE BELT BEFORE IT RE-ENTERS THE WATER AND STARTS ALL OVER AGAIN. THE WATER ON THIS SIDE OF THE BAFFLE LOOKS PRETTY CLEAN TO ME.

BY THE TIME IT GOES THROUGH THIS LAST FILTERING PROCESS, CARLA, THE WATER IS ACTUALLY COMPARABLE TO OUR WATER SUPPLY. HERE, THE WATER FILTERS THROUGH NEARLY A HUNDRED TONS OF ANTHRACITE COAL, GRAVEL, AND FINE SAND IN LAYERS. THEN IT FLOWS INTO THE STORAGE LAKE AND THE SURPLUS GOES INTO STREAMS.

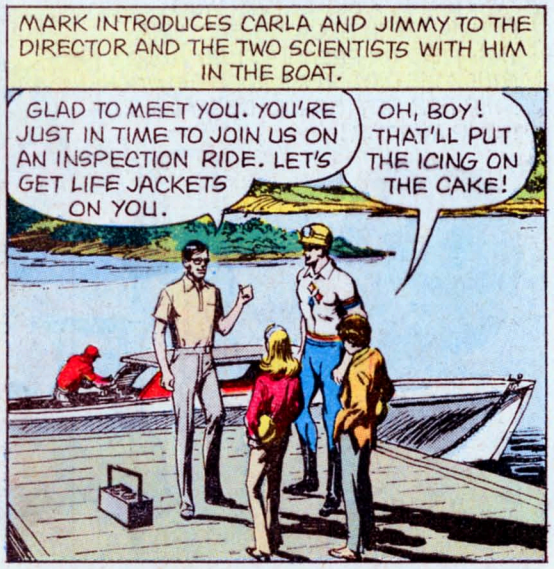

THIS IS A HOT STRIP ROLLING MILL. AFTER THE ROLLED STEEL COOLS IT IS PICKLED TO CLEAN IT BEFORE BEING SHIPPED.
PICKLED STEEL?
WHY NOT? YOU'VE HEARD OF AN IRON HORSE AND A BRASS MONKEY!


IT DOES SOUND LIKE A GAG. BUT STEEL DOES FORM AN OXIDE FILM AS IT IS HEATED AND ROLLED. SO IT IS DIPPED IN DILUTED SULFURIC OR HYDROCHLORIC ACID TO GET RID OF IT. THAT'S CALLED "PICKLING".
THAT MEANS THERE'S A LIQUID USED. WHAT'S DONE WITH IT?


"THIS IS AN AREA WHERE POLLUTION CONTROL RESEARCH IS A CONSTANT ACTIVITY. CLEAN WATER IS AS VITAL TO STEEL PRODUCTION AS IT IS TO THE ENVIRONMENT. MANY METHODS OF GETTING RID OF POLLUTANTS ARE USED. MANY MORE ARE IN THE EXPERIMENTAL STAGE."


FOR EXAMPLE—ONE METHOD OF POLLUTION CONTROL IS A "BACTERIA CAFETERIA". MAKING COKE FROM COAL RESULTS IN WASTE LIQUIDS CONTAINING PHENOLS—CHEMICALS THAT ARE A BIG DISPOSAL HEADACHE. SO...
"...STEEL RESEARCH SCIENTISTS ARE WORKING ON A PROCESS IN WHICH CERTAIN HARMLESS BACTERIA REGARD PHENOL AS THEIR FAVORITE FOOD. THEY EAT UP 99.9 PER CENT OF THE PHENOL WASTE AND CONVERT IT INTO CARBON DIOXIDE AND WATER.
ACIDS AND CAUSTIC WASTES FROM TIN PLATING STEEL FOR THE MILLIONS OF FOOD-PROTECTING "TIN" CANS USED EVERY DAY AND FROM THE PICKLING OF STEEL ARE EFFECTIVELY RECOVERED OR NEUTRALIZED IN SYSTEMS LIKE THIS ONE.
THIS IS CALLED A "FLOCCULATOR-CLARIFIER!" OILY WASTE WATER FLOWS INTO THE SMALL CIRCLE FROM THE MILL FIRST. THAT REVOLVING ARM SKIMS OFF SURFACE OILS INTO "RUN OFF" BOXES. THE WATER THEN FLOWS INTO SETTLING COMPARTMENTS. THESE ARE REGULARLY RAKED TO REMOVE THE SEDIMENT.
THE WATER GETS CLEANER IN EACH RING.
I CAN SEE THE OIL THAT'S BEING SKIMMED OFF!

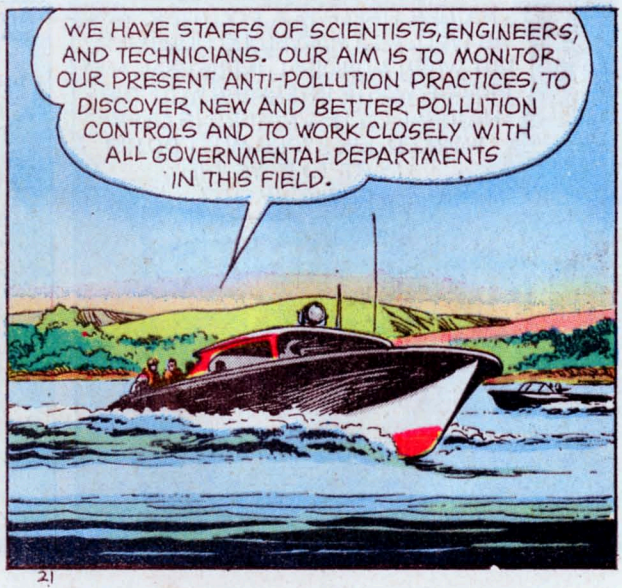
LET'S GO DOWN TO THE LAKE. THE DIRECTOR OF ENVIRONMENTAL CONTROL SHOULD BE THERE NOW.


MARK INTRODUCES CARLA AND JIMMY TO THE DIRECTOR AND THE TWO SCIENTISTS WITH HIM IN THE BOAT.
GLAD TO MEET YOU. YOU'RE JUST IN TIME TO JOIN US ON AN INSPECTION RIDE. LET'S GET LIFE JACKETS ON YOU.
OH, BOY! THAT'LL PUT THE ICING ON THE CAKE!

WE INSPECT THIS LAKE CONTINUALLY BECAUSE WE DISCHARGE OUR TREATED WATER INTO IT. WE WANT TO BE SURE WE'RE NOT SPILLING OUT ANYTHING THAT MIGHT POLLUTE IT.

THESE SAMPLES CAME FROM DIFFERENT LOCATIONS. THEY'LL GO TO OUR WATER LAB FOR TESTS.
IT'S AMAZING! STEELMAKERS COLLECTING AND TESTING WATER!

IT MAY SURPRISE YOU TO LEARN I'M NOT A STEELMAKER, BUT A BIO-CHEMICAL ENGINEER. MANY STEEL COMPANIES HAVE HAD PEOPLE LIKE ME ON THEIR PAYROLLS FOR YEARS.


WE HAVE STAFFS OF SCIENTISTS, ENGINEERS, AND TECHNICIANS. OUR AIM IS TO MONITOR OUR PRESENT ANTI-POLLUTION PRACTICES, TO DISCOVER NEW AND BETTER POLLUTION CONTROLS AND TO WORK CLOSELY WITH ALL GOVERNMENTAL DEPARTMENTS IN THIS FIELD.

"WE EMPLOY BIOLOGISTS WHO SPECIALIZE IN GROWING BACTERIA THAT FEED ON PHENOLS. THEY ALSO STUDY THE OXYGEN-MICROBE RELATIONSHIP FOR BETTER BIO-DEGRADING OF SOLID MATTER!

"THERE ARE FORESTRY EXPERTS WHO PLANT SEEDLINGS ON MINE AND QUARRY TAILINGS IN REFORESTATION PROGRAMS.

"HORTICULTURISTS AND LANDSCAPE GARDENERS BEAUTIFY STEEL PLANT GROUNDS WITH SHRUBS AND GRASS.

ALL THESE THINGS WE DO ARE PART OF BEING GOOD CORPORATE CITIZENS OF OUR COMMUNITY.

STEELMAKERS HOPE THAT THEIR EXAMPLE OF ENVIRONMENTAL QUALITY CONTROL WILL INSPIRE OTHERS TO DO THE SAME.

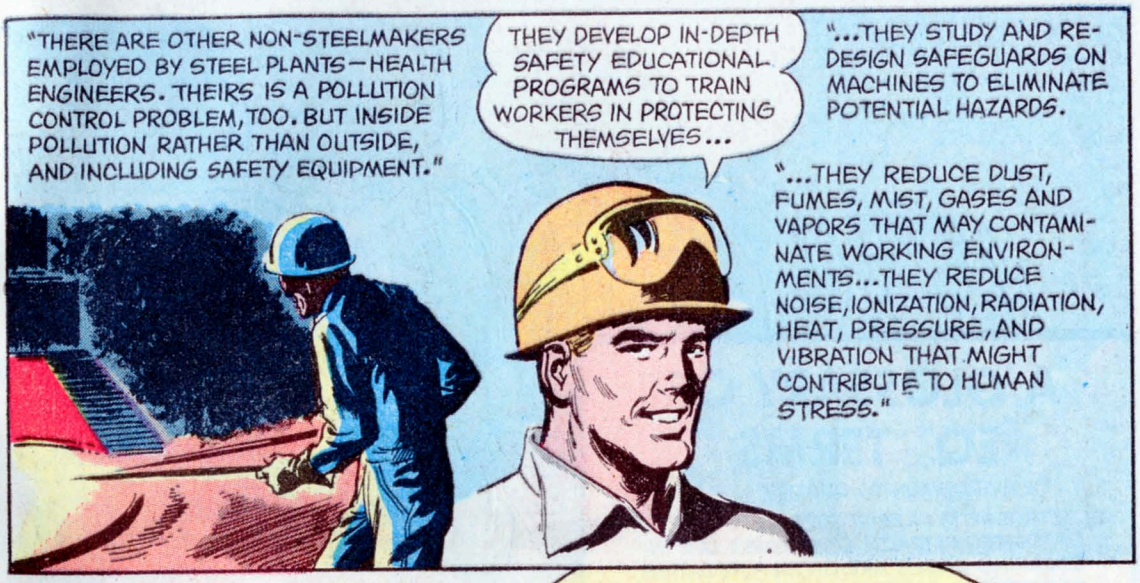
MANY TOWNS, VILLAGES—EVEN SOME LARGE CITIES—STILL DUMP RAW SEWAGE INTO RIVERS AND STREAMS. MANY PEOPLE WHO COMPLAIN ABOUT INDUSTRY WILL VOTE AGAINST TAXES TO BUILD TREATMENT PLANTS THAT WOULD END SUCH POLLUTION!

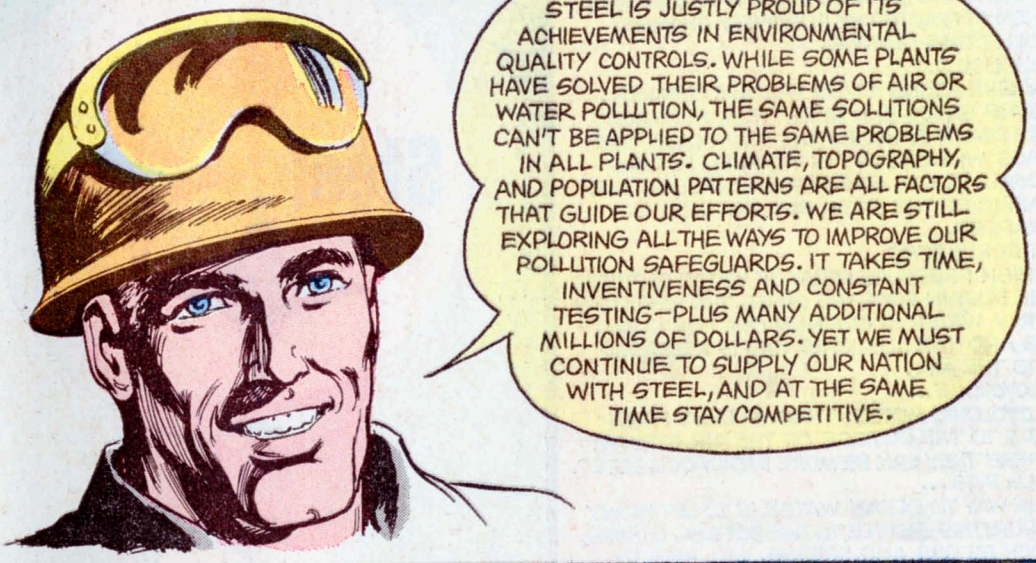
NATURE ITSELF IS A POLLUTER AS WELL AS A MARVELOUS CLEANSER. BUT WHEN MUNICIPAL, INDUSTRIAL, AND PRIVATE WASTE INTERFERE WITH THE NATURAL CYCLES, NATURE IS OVERWORKED. EVERYONE MUST DO HIS PART TO SAVE THE ENVIRONMENT!

ALL TOO SOON THE TRIP IS OVER...

THAT WAS REAL COOL!

I'LL SAY. I WOULDN'T MIND BEING THAT KIND OF AN ENGINEER. BUT I'D TAKE A FISHING POLE ALONG!


"THERE ARE OTHER NON-STEELMAKERS EMPLOYED BY STEEL PLANTS—HEALTH ENGINEERS. THEIRS IS A POLLUTION CONTROL PROBLEM, TOO. BUT INSIDE POLLUTION RATHER THAN OUTSIDE, AND INCLUDING SAFETY EQUIPMENT."
THEY DEVELOP IN-DEPTH SAFETY EDUCATIONAL PROGRAMS TO TRAIN WORKERS IN PROTECTING THEMSELVES...
"...THEY STUDY AND RE-DESIGN SAFEGUARDS ON MACHINES TO ELIMINATE POTENTIAL HAZARDS.
"...THEY REDUCE DUST, FUMES, MIST, GASES AND VAPORS THAT MAY CONTAMINATE WORKING ENVIRONMENTS...THEY REDUCE NOISE, IONIZATION, RADIATION, HEAT, PRESSURE, AND VIBRATION THAT MIGHT CONTRIBUTE TO HUMAN STRESS."


STEEL IS JUSTLY PROUD OF ITS ACHIEVEMENTS IN ENVIRONMENTAL QUALITY CONTROLS. WHILE SOME PLANTS HAVE SOLVED THEIR PROBLEMS OF AIR OR WATER POLLUTION, THE SAME SOLUTIONS CAN'T BE APPLIED TO THE SAME PROBLEMS IN ALL PLANTS. CLIMATE, TOPOGRAPHY, AND POPULATION PATTERNS ARE ALL FACTORS THAT GUIDE OUR EFFORTS. WE ARE STILL EXPLORING ALL THE WAYS TO IMPROVE OUR POLLUTION SAFEGUARDS. IT TAKES TIME, INVENTIVENESS AND CONSTANT TESTING—PLUS MANY ADDITIONAL MILLIONS OF DOLLARS. YET WE MUST CONTINUE TO SUPPLY OUR NATION WITH STEEL, AND AT THE SAME TIME STAY COMPETITIVE.

JIMMY! HOW DID WE GET HERE? WHERE'S MARK STEEL? I DIDN'T THANK HIM FOR SHOWING US HOW THE STEEL INDUSTRY IS HELPING PROTECT THE ENVIRONMENT!
HE APPEARS AND DISAPPEARS. I DON'T KNOW HOW HE DOES IT, BUT I'M NOT COMPLAINING. I GOT A SWELL MARK ON MY LAST SCHOOL REPORT WITH MARK STEEL'S HELP.

A GLOSSARY OF EQ* TERMS

*ENVIRONMENTAL QUALITY

ELECTROSTATIC PRECIPITATOR...
OPPOSITES ATTRACT! DUST PARTICLES IN ESCAPING GASES ARE GIVEN A NEGATIVE ELECTRICAL CHARGE. THESE PARTICLES ARE THEN ATTRACTED BY POSITIVELY CHARGED COLLECTING DEVICES.

BAGHOUSE...
IMAGINE A KING-SIZED VACUUM CLEANER. RISING GASES AND DUST FROM FURNACES ARE DRAWN BY HUGE FANS INTO COLLECTING BAGS WHERE DUST IS TRAPPED FOR DISPOSAL. CLEAN GAS PASSES THROUGH THE FABRIC OF THE BAGS, BUT THE DUST IS TRAPPED.

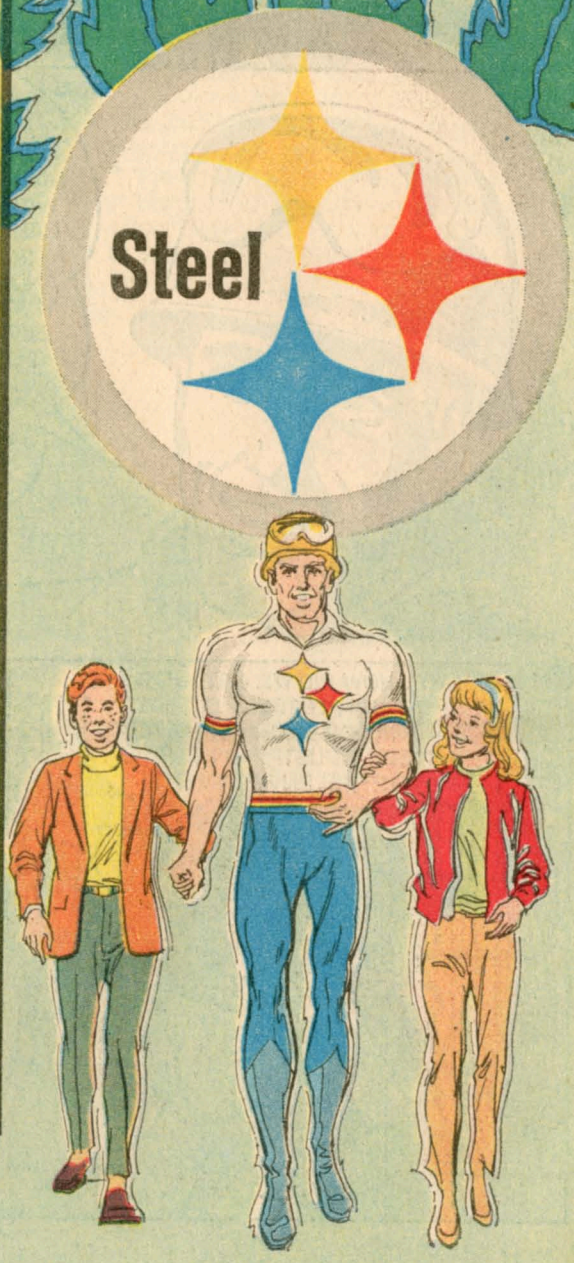
WET SCRUBBERS...
A HIGH PRESSURE SPRAY OF WATER CAPTURES THE DUST IN ESCAPING GASES. THE RESULTING DIRTY WATER IS DRAINED OFF FOR CLEANING AND THE CLEANSED GAS IS RELEASED INTO THE AIR.

THE CYCLONE...
A CYCLONIC MOTION THROWS DUST PARTICLES TO THE OUTSIDE OF THE AIR STREAM WHERE THEY CAN BE MORE EASILY COLLECTED.

SCALE PITS...
ONE WAY TO CLEAN WATER IS TO LET HEAVY IMPURITIES SETTLE TO THE BOTTOM. OTHERS, SUCH AS OILS AND GREASE, WILL RISE TO THE SURFACE. THE IMPURITIES ARE COLLECTED, AND MUCH CLEANER WATER REMAINS. THIS IS HOW A SCALE PIT WORKS.

CLARIFIERS...
USED WATER CAN BE MUCH BETTER THE SECOND TIME AROUND! THE ACTION OF A CONSTANTLY ROTATING PADDLE HELPS REMOVE FINE PARTICLES WHICH HAVE SETTLED TO THE BOTTOM IN WATER AFTER THE INITIAL CLEANING TREATMENTS.

PHENOL EATERS...
A BACTERIA CAFETERIA! COKE IS A VITAL INGREDIENT IN STEELMAKING. PHENOL, AN ANNOYING POLLUTANT, IS A BY-PRODUCT OF THE COKE-MAKING PROCESS. STEEL COMPANIES ARE NOW "GROWING" CERTAIN BACTERIA THAT EAT PHENOL AND DIGEST THE POLLUTANT INTO HARMLESS CARBON DIOXIDE AND WATER.



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